A STUDY OF LINT DEVELOPMENT IN COTTON AS INFLUENCED BY ENVIRONMENTAL FACTORS

THESIS FOR THE DEGREE OF PH. D.

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A STUDY OF LINT DEVELOPMENT IN COTTON AS INFLUENCED BY ENVIRONMENTAL FACTORS.

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THESIS

TABLE OF CONTENTS

INTRODUCTION.

Cotton (Gossypium hirsutum, L.) is the most important cash crop of the southern portion of the United States. The value of the product is influenced by its quality as is the case of most other crops. The trade recognizes that the length of lint is one of the most important factors that is considered in the classing of cotton. Often such things as "drag" and strength are taken into consideration, but these are not nearly so easily measured nor are they so well understood as is the length of lint.

The farmer is confronted with the task of producing a better quality in the lint, and the trade is often confused as to what factors constitute quality. The trade applies certain names such as "Benders", "Rivers", etc. to cotton from a special section which is recognized as being of a high quality and distinguishes it from cotton from some other section which is of a different quality. So far no one has reported finding out why these differences exist or what these differences are. Are these differences due to a difference in length of lint, or does strength, drag, and possibly other factors influence them? Differences in length of lint are known to exist, but differences in the other factors are not so well proved. Are these differences in the length of lint, which are known to exist, due to environmental influences such as soil type, rainfall, and temperature, or are they due to the variety of cotton grown?

There has been very little research done in this country on the quality of the fiber as influenced by environment. The effect of the

environment on the length of lint and other properties of the fiber has received very little attention. Most of the work on this has been in Egypt, India, and the West Indies under conditions differing from those in the southeastern United States and with a different species of Gossypium.

The problem in this work was to determine what caused the variations which were known to exist. A solution of this problem should be of interest to the plant breeder who is attempting to select better strains of cotton and to the farmer who is endeavoring to produce a better quality of lint, also to the buyer that wishes to buy cotton of a definite quality.

PREVIOUS INVESTIGATIONS.

The most notable works of this nature have been performed by Balls, working with Egyptian cotton in Egypt, and by Hurd and Parsons, working in the west Indies with Sea Island cotton. The published literature reports experiments that were conducted under widely different conditions from those in the southeastern United States.

Balls (1) states that the lint fibers of cotton are the result of the outgrowth of epidermal cells in the seed coat. The length these attain determines the length of the lint, and the extent of filling with layers of cellulose determines the strength. Any conditions that would produce a noticeable effect in the physiological functions of the plant might affect the length and strength of lint.

In working with cotton under irrigation he found that a deficiency in the soil moisture during the first twenty-three days after a blossom appeared would be associated with a shortening of the length of

fiber produced by the boll that developed from this blossom. A deficiency in soil moisture during the period from twenty-three days after blossoming to maturity was associated with a weakening of the fiber. He concluded that the most critical period in the development of the length of fiber was around the sixteenth day after blooming.

By making histological studies he found that fibers reached their maximum length about the twenty-fourth day and made their most rapid growth around the fifteenth day following flowering. They began filling with cellulose about the twenty-first day. These studies seemed to agree with his conclusions regarding the time periods when these characters were most likely to be seriously affected by any adverse edaphic or climatic factor. Balls also suggested that a rise of the water table which would destroy part of the root system of a plant would shorten the lint that was then developing in length and weaken that which was filling.

Burd (2) (3) concluded that in the West Indies a heavy rainfall about nineteen days after flowering seriously lowered the mean maximum length of lint.

Harland (5) reported that F. S. Parsons working at the Imperial College of Tropical Agriculture found that moisture determined the length of lint.

The conclusions of Burd are the reverse of those of Balls and Parsons. It seems that any condition which disturbs the normal functions of a plant may reduce the length of lint whether this disturbance be due to a water stress or smothering by excess water.

Youngblood (10) by studying the Government reports on the length of lint from various sections of the south and correlating this with the soil type concluded that longer lint came from heavier more fertile soils.

He noted an exception to this in the case of cotton from the Piedmont region. These soils were often light and low in fertility yet they produced better cotton than did the coastal plain soils which were sandy and low in fertility.

Funchess (4) after studying the results of variety tests in Alabama, concluded that the soil does not affect the length of lint. He showed that one year an area produced cotton with the longest lint in the state and the following year produced cotton with the shortest lint. He suggested that this difference might be due to a difference in rainfall for the two years in question.

Ludwig (7) working with American upland cotton in South Carolina concluded that "late defoliation did not affect the length of lint but if done several weeks before maturity the strength of the fiber was lowered". The earliest defoliation that was used was on August 20, which is probably after most of the bolls were old enough for the fibers to have reached their maximum length.

Kearney (6) working with Pima cotton in Arizona concluded that "the bolls higher up the stalk had a longer fiber than those nearer the base". He did not make any physiological explanation of this, neither did he take any physiological factors into consideration.

There have been some other workers in physiological problems of cotton, but their experiments do not deal with lint formation specifically and their results do not give any solution to this problem. As may be seen from the literature reviewed, the problem is far from settled and there has been little progress made toward its solution in this country.

MATERIALS AND METHODS.

This investigation was conducted at the Alabama Agricultural Experiment Station, Auburn, Alabama. All plots and all cans were fertilized at the rate of 1000 lbs. of super-phosphate, 500 lbs. of nitrate of soda, and 100 lbs. of muriate of potash per acre. This rate was based on surface area and not on weight of soil. A pure-line strain of Mexican Big Boll cotton which had bred true for twelve years was used. This is a typical variety of American upland cotton, and when grown under good conditions this strain produces a staple 1 1/8 inches in length. The seed were obtained from the North Carolina Agricultural Experiment Station at the beginning of this experiment.

In this investigation it was planned to study the influence of soil type and the influence of climatic factors on the development of the lint. Two distinctly different methods were used. In a study with different soil types large galvanized iron cans were used as containers. These held about 1000 lbs. of dry soil each. In the study of climatic factors plots in the field were used. It was desirable to use field plots in order to get large numbers of plants and also to have conditions as nearly normal as possible. It was not possible to use field plots for the soil type studies because it was desirable to use two widely different types of soils and keep them under the same climatic conditions, and they did not occur naturally that way.

Soil Type Studies.

The method of Veihmeyer (8) (9) was used in this study. Cans 30 inches in diameter and 24 inches deep specially constructed of 20 gauge galvanized iron and so constructed that they could be lifted for weighing

were used. The cans were fitted with a galvanized iron lid which had a hole in the center 4 inches in diameter through which the plants could grow. All cans were painted with acid proof paint to prevent zinc injury to the plants. They were filled with soil in layers as it had occurred in the field. Two 8 inch layers of subsoil and one 6 inch layer of top soil was used. The soil was weighed and put in the cans so that each can contained the same amount of each respective layer. The weight of the layers was not the same. It was packed as it was placed in the cans so that each layer occupied the same space in each can. The cans extended two inches above the soil to permit watering.

The moisture content of the soil was not kept constant. When the soil had lost considerable moisture but before the plants had begun to wilt, water was added to the point of the water-holding capacity of the soil. This was accomplished by adding water until the cans regained their original weight which had been previously determined. No definite interval of time was used to determine when to water--weight was the only guide. Veihmeyer (9) and others have shown that it is impossible to moisten a soil uniformly to a definite moisture content below that of the water holding capacity. Furthermore, it has been shown that a plant uses water satisfactorily over a wide range of moisture content extending from water-holding capacity to wilting-point. Thus by adding water until the soil moisture was at the point of water-holding capacity, it was possible to get all of the soil wet and not limit the area of root growth.

Two soils of very different type were used. The two soils were from areas that produce cotton considered by the trade to be widely different. One of the soils was classed as Norfolk sandy loam and came from a field at Auburn. The cotton from the Norfolk soil at Auburn is consid-

ered to be of poor quality and is often sold at a discount. The other soil used was from the Mississippi Delta and was shipped from Stoneville, Mississippi. This soil was classed as Deer Creek loam and produces cotton that is considered to be of high quality and usually brings a premium on the market. It was thought that if soil type exerted an important influence on the quality of cotton these two extremes would show it.

These two soils differ very much in their characteristics. The Delta soil is an alluvial soil of fine texture, rich in organic matter; it contains a large amount of mineral nutrients and is quite uniform throughout. There is no line of demarcation between the top soil and the subsoil so it is classed as a deep fertile soil. The Norfolk soil is of a coarser texture, very low in organic matter, and contains a relatively low percentage of mineral nutrients and is not uniform. The top soil is usually 4 to 8 inches in depth and is underlaid by a yellow to reddish clay which is very compact. This soil is classed as a shallow soil low in fertility.

The cans were placed in a trench so that the tops were level with the surface of the soil. Plants were planted around the trench to make conditions as near normal as possible. Thirteen cans were used for each soil type and two plants were left in each can. This gave a total of 26 plants in each soil type from which results were obtained. Weighing was done by means of a specially constructed beam scale similar to the ones used in weighing baled cotton and was capable of weighing up to 1500 lbs. with an accuracy of 1 ounce. This scale was swung from a frame by means of which the cans could be raised. This experiment was located adjacent to the plots used in the climatic factor studies so that the records for

temperature, humidity, etc. were applicable for both experiments.

Soil Moisture Studies.

In this work a method somewhat similar to that used by Balls was employed. Plots in the field were irrigated to produce varying conditions of moisture. The plots were 20 ft. by 20 ft. in size with a 2 ft. alley between them. Each plot was surrounded by a wall of galvanized iron placed 2 feet deep in the ground to prevent the roots of the plants from feeding outside the plots. A row of plants was grown in the alleys and on the outside of all plots to make conditions as near normal as possible and as a further precaution to keep the plants from getting moisture from soil outside of the plots. A wooden frame was built over the plots over which a canvas cover could be placed during a rain to prevent water from getting on the plots. When it was not raining the cover was rolled back out of the way.

The cotton was planted in rows 4 feet apart and with 2 feet between hills in the row. Two plants were grown in each hill giving 100 plants per plot. The time of irrigation of the various plots is shown in Table 1. The rate was 1 inch of water each time they were irrigated. Usually this was applied at night to prevent scalding and excessive water losses by evaporation. If it was applied in the daytime it was done only on a cloudy afternoon. The plots were laid off in 16 sections and small banks of soil thrown up at the borders of these so as to confine the water and prevent it from running into pools in the lower areas. This made it possible to irrigate the plots uniformly. The water was measured by means of a standard water meter capable of measuring to a fraction of a gallon.

Soil moisture records were obtained by taking samples of soil

Table 1.

The Dates of Irrigation* of the Plots.

Year 1928				Year 1929			
Plot Number				Plot Number			
1	2	3	4	1	2	3	4
June 20	June 20	June 20	June 20	June 12			
" 27				June 19	June 19		
July 4	July 4			July 26			
July 11				July 3	July 3	July 3	
July 18	July 18	July 18		July 10			
July 25				July 17	July 17		
Aug. 1	Aug. 1			July 24			
Aug. 8				July 31	July 31	July 31	July 31
Aug. 15	Aug. 15	Aug. 15	Aug. 15	Aug. 7			
Aug. 22				Aug. 14	Aug. 14		
Aug. 29	Aug. 29			Aug. 21			
Sept. 5				Sept. 28	Aug. 28	Aug. 28	
" 12	Sept. 12	Sept. 12					
" 19							
" 26	Sept. 26						
Oct. 3							
" 10	Oct. 10	Oct. 10	Oct. 10				

*Irrigated at the rate of 1 inch on each date.

at three depths, viz. 0 - 8, 8 - 16, and 16 - 24 inches, so the moisture content could be determined for 8 inch layers from 0 - 24 inches or for the entire depth. Only one sample per plot was obtained each week and in case the plot was to be irrigated this was taken before the irrigation rather than after it. It was considered undesirable to take more samples in a plot this small because of the danger of injuring the roots of the plants. The samples were always taken from between the rows and not in the rows with the plants. It is realized that these few samples are not sufficient to give results with a large degree of accuracy, but they do offer some indication as to the soil moisture conditions under which the plants were growing.

Atmospheric Records.

Temperature and humidity records were obtained from a hygrothermograph placed in a covered lattice house 6 inches from the surface of the soil and adjacent to the plots. Evaporation was measured by means of standardized atmometers placed between the rows of the cotton in such a manner that the white porous cups were about one foot above the surface of the soil. Records were made within each plot and also outside of them. Atmometers with black cups were also used outside the plots to determine the effect of sunshine.

Blossom and Boll Records.

The blossoms were marked with a numbered marking tag as they appeared. This number was used as a means of identification throughout the remainder of the studies. If a blossom was shedded or the boll rotted, a notation was made of it which showed the plot or can that it came from. About the time the first bolls began to open a chart was made of each stalk

which showed the exact location of the stalk and the position of each boll on the stalk. The bolls were harvested separately. The cotton was permitted to come to uniform moisture content before the measurements were made, and all of the measurements were made on each boll. Records were kept by number only so that the person making the measurements had no knowledge of the location of a boll while making them. After all measurements were made the source of the boll was recorded with this data.

Method of Measuring Lint.

The length of lint was determined by a method similar to the one used by Balls. The lint was combed out from the seed in a fan-shaped array and then by means of a pair of dividers the length of lint could be measured. Usually five or more measurements were made on each boll and when possible at least one seed from each lock was used. It was not always possible to identify the individual locks. The average of these measurements was recorded as the length of lint for this boll. Balls has shown that this is the most accurate way of rapidly determining the average length of lint of a boll. This length as shown by Balls is somewhat less than the length obtained by cotton classers in pulling, so the measurements recorded are less than those that would have been obtained by that method. The measurements were made in all cases by the same person.

Methods Used in Other Determinations.

The weight per boll was determined by weighing on a balance accurate to a milligram but the weight was recorded only to the nearest centigram. The cotton was ginned on a roller gin for ginning boll lots. The lint was weighed and the seed weight obtained by difference. The number of seed was counted after ginning. The per cent of lint was deter-

mined by dividing the weight of the lint by the weight of the boll. The weight per seed and lint per seed were obtained by calculation.

The total number of bolls measured in each treatment is shown in the various tables. It may be observed that this number varied from 168 in the case of cotton grown in the Norfolk sand in cans to 929 in the case of the field plot irrigated each week.

EXPERIMENTAL RESULTS.

Length of Lint Studies.

Influence of Soil Type on the Length of Lint.

The average results by weekly periods obtained in this study are shown in Tables 2 and 3. The data by days in more detail is recorded in Tables 1, 2, 3, and 4 in the appendix. A study of these data shows that the type of soil has had no influence on the length of lint. The lint that was produced by the cotton on the Norfolk soil in 1928 averaged 24.9 mm. in length while that produced on the Deer Creek loam averaged 25.0 mm. In 1929 the average was 24.4 mm. for the lint produced from cotton on the Norfolk soil and 24.1 mm. for that on the Deer Creek loam. It is noted that in 1928 the lint from the Deer Creek loam is .1 of a mm. longer and in 1929 .3 of a mm. shorter than that from the Norfolk soil. These differences are not significant, and it may be concluded that the soils produced cotton of the same length of fiber.

These results are illustrated by graph No. 1. An examination of this graph will reveal the fact that there was no marked tendency for the lint from cotton grown on either soil to be longer than that from the other. The curves cross and recross several times showing that the soil type was not affecting the length of lint.

Table 2.

The averages by seven day* periods of the determinations made on cotton grown in different soil types in 1920.

Period of Blooming	Total No. of Bolls	Wt. per boll gms.	Length of lint mm.	No. of seed per boll	Per cent lint	Wt. of lint per boll gms.	Wt. of seed per boll gms.	Wt. per seed gms.	Wt. of lint per seed gms.
Cotton grown in Norfolk sandy loam									
July 18	28	7.44	25.0	31.9	38.6	2.87	4.57	0.143	0.0900
July 25	54	7.21	24.9	32.7	39.0	2.81	4.40	0.135	0.0859
Aug. 1	64	7.28	25.2	34.8	39.4	2.87	4.41	0.127	0.0825
Aug. 8	58	7.23	24.8	34.1	37.7	2.74	4.54	0.133	0.0804
Aug. 15	15	5.59	23.9	30.1	37.5	2.10	3.49	0.116	0.0700
Weighted Average	219	7.21	24.9	33.4	38.4	2.73	4.32	0.129	0.0817
Cotton grown in Deer Creek loam									
July 11	25	6.42	24.9	30.1	38.6	2.48	3.94	0.131	0.0824
July 18	103	7.75	25.0	33.9	39.3	3.05	4.70	0.131	0.0830
July 25	136	7.70	25.1	34.3	38.4	2.93	4.74	0.137	0.0853
Aug. 1	62	7.58	25.2	33.5	37.3	2.85	4.73	0.138	0.0853
Aug. 8	32	6.02	24.3	31.2	39.0	2.35	3.67	0.117	0.0753
Weighted Average	358	7.46	25.0	34.5	38.3	2.88	4.58	0.132	0.0835

*Three days before and three days after the date recorded in the table.

Table 3.

The averages by seven-day* periods of the determinations made on cotton grown in different soil types in 1929.

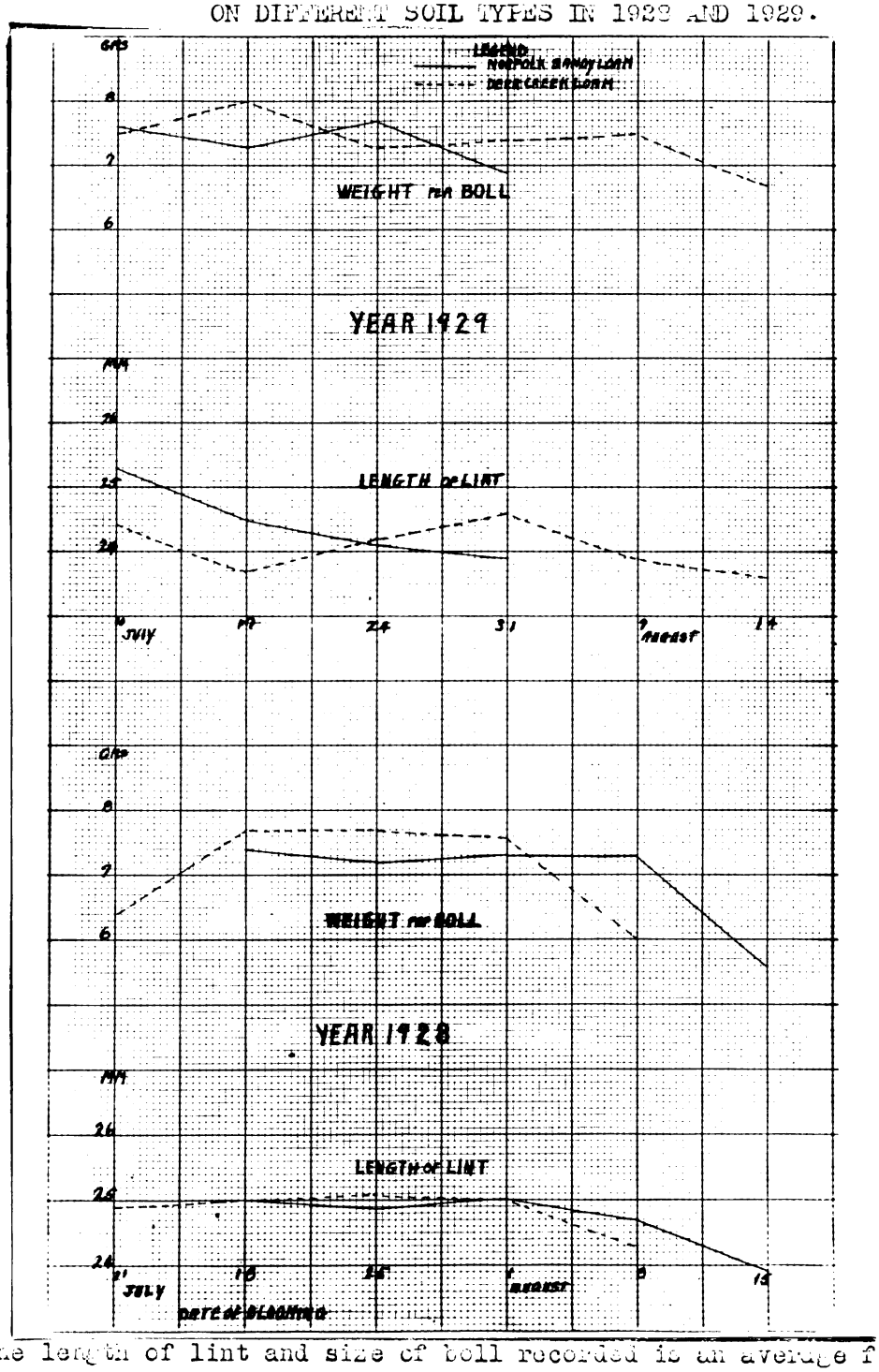
Period of Blooming	Total No. of Bolls	Wt. per boll gms.	Length of lint mm.	No. of seed per boll	Per cent lint	Wt. of lint per boll gms.	Wt. of Seed per boll gms.	Wt. per seed gms.	Wt. of lint per seed gms.
Cotton grown in Norfolk sandy loam									
July 10	15	7.59	25.3	34.1	38.9	2.95	4.34	0.130	0.0865
July 17	93	7.25	24.5	35.1	40.1	2.91	4.34	0.124	0.0829
July 24	42	7.35	24.1	36.5	40.3	3.08	4.56	0.125	0.0844
July 31	15	6.65	23.9	32.9	39.6	2.64	4.11	0.125	0.0802
Weighted Average	169	7.34	24.4	35.2	39.9	2.93	4.41	0.125	0.0836
Cotton grown in Deer Creek loam									
July 10	7	7.50	24.4	36.4	39.3	2.95	4.55	0.133	0.0810
July 17	74	8.03	23.7	38.5	40.0	3.22	4.81	0.125	0.0836
July 24	39	7.29	24.2	34.9	40.6	2.96	4.33	0.124	0.0848
July 31	45	7.37	24.6	33.3	38.8	2.86	4.51	0.135	0.0859
Aug. 7	36	7.47	23.9	35.9	40.1	3.00	4.47	0.125	0.0836
Aug. 14	10	6.69	23.6	34.8	38.5	2.58	4.11	0.118	0.0741
Weighted Average	211	7.57	24.1	36.0	39.7	3.02	4.56	0.126	0.0837

*Three days before and three days after the date recorded in the table.

CHART NO. 1

THE LENGTH OF LINT AND SIZE OF BOLL PRODUCED

ON DIFFERENT SOIL TYPES IN 1928 AND 1929.



(The length of lint and size of boll recorded is an average for 7 days, 3 days before and 3 days after the date indicated.)

Influence of Temperature, Humidity, or Evaporation on the Length of Lint.

The data obtained in this experiment are recorded in Tables 4, 5, and 6. The data by days in more detail is shown in Tables 5 to 12 inclusive in the appendix. These data do not show any relation between any of the factors considered to the length of lint. The results for plot 1 which was irrigated each week are illustrated by graphs 2 and 4. Those for plot 4 which was irrigated only every 8 weeks are shown by graphs 3 and 5. The results from plots 2 and 3 are not illustrated by graphs as they were intermediate between the results on the other two plots. These graphs show that there was no tendency for the length of lint to be associated with any of these factors. It is concluded that under the conditions of this experiment the climatic factors did not influence the length of lint.

Influence of Soil Moisture on the Length of Lint.

This experiment was conducted in the field and the plots were irrigated at varying intervals, so that the plants on some plots were grown under very droughty conditions while others were grown under moist conditions. Four plots were used which were irrigated at the rate of 1 inch of water each time as follows: plot 1 each week, plot 2 every two weeks, plot 3 every four weeks, and plot 4 every eight weeks.

The results are recorded in Tables 4, 5, and 7. The data is shown in more detail in Tables 5 to 12 inclusive in the appendix. It may been seen from these data that the length of lint produced by a cotton plant was influenced to a large extent by the soil moisture conditions under which the plant grew while the lint was developing. The average length of lint produced on plot 1 in 1923 was 25.7 mm. while that produced on plot four was only 24.8 mm. The average length of lint produced

Table 4

The averages by seven-day* periods of the determinations made on cotton irrigated at different frequencies in 1923.

Period of Blooming	Total No. of Bolls	Wt. per boll gms.	Length of lint mm.	No. of seed per boll	Per cent lint	Wt. of lint per boll gms.	Wt. of Seed per boll gms.	Wt. per seed gms.	Wt. of lint per seed gms.
Plot 1. Irrigated each week.									
July 25	56	7.96	25.2	29.3	35.7	2.90	5.16	0.176	0.0956
Aug. 1	109	8.08	25.7	30.5	35.8	2.95	5.13	0.169	0.0973
Aug. 8	252	8.56	26.1	31.4	35.4	3.03	5.53	0.176	0.0965
Aug. 15	79	7.39	25.3	29.5	35.1	2.61	4.77	0.162	0.0885
Aug. 22	35	7.13	24.0	28.7	36.3	2.64	4.54	0.158	0.0920
Weighted Average	531	8.13	25.7	30.5	35.5	2.90	5.24	0.171	0.0950
Plot 2. Irrigated every two weeks.									
July 18	13	7.24	25.0	28.8	36.3	2.65	4.59	0.159	0.0920
July 25	106	7.42	24.6	28.3	36.7	2.72	4.70	0.163	0.0944
Aug. 1	147	7.34	24.1	30.5	36.5	2.68	4.66	0.153	0.0879
Aug. 8	236	7.46	25.1	30.4	37.4	2.79	4.67	0.154	0.0918
Aug. 15	117	6.34	23.1	30.3	38.3	2.43	3.91	0.129	0.0762
Weighted Average	619	7.21	24.4	30.1	37.2	2.68	4.53	0.150	0.0930
Plot 3. Irrigated every four weeks.									
July 25	65	7.19	24.7	28.4	38.0	2.75	4.45	0.157	0.0961
Aug. 1	142	6.92	24.7	29.7	37.1	2.57	4.55	0.143	0.0865
Aug. 8	224	7.83	25.9	30.9	37.1	2.72	4.61	0.149	0.0880
Aug. 15	127	5.57	24.0	27.0	39.5	2.20	3.57	0.125	0.0815
Weighted Average	558	6.81	24.9	29.4	37.6	2.56	4.25	0.145	0.0871
Plot 4. Irrigated every eight weeks.									
July 25	101	6.86	24.3	30.7	37.9	2.65	4.22	0.137	0.0865
Aug. 1	152	7.52	24.2	32.2	37.9	2.88	4.54	0.141	0.0894
Aug. 8	135	7.47	25.7	32.0	37.0	2.77	4.71	0.147	0.0866
Aug. 15	100	5.56	23.8	28.8	39.4	2.23	3.35	0.116	0.0774
Weighted Average	488	6.95	24.6	31.1	38.1	2.65	4.27	0.137	0.0852

*Three days before and three days after the date recorded in the table.

Table 5.

The averages by seven-day* periods of the determinations made on cotton irrigated at different frequencies in 1929.

Period of Blooming	Total No. of Bolls	Wt. per boll gms.	Length of lint m.m.	No. of seed per boll	Per cent lint	Wt. of lint per boll gms.	Wt. of seed per boll gms.	Wt. per seed gms.	Wt. of lint per seed gms.
Plot 1. Irrigated each week									
July 3	16	7.85	25.8	29.2	38.9	2.94	4.91	0.138	0.1007
July 10	132	8.33	26.2	32.3	36.9	3.08	5.27	0.162	0.0945
July 17	144	7.98	25.3	34.9	37.5	2.99	5.00	0.143	0.0857
July 24	291	7.06	24.4	31.5	39.9	2.82	4.25	0.135	0.0895
July 31	296	7.12	25.3	31.9	40.3	2.87	4.25	0.133	0.0896
Aug. 7	34	7.05	25.9	30.3	39.1	2.76	4.29	0.141	0.0905
Aug. 14	17	6.41	24.1	29.3	36.7	2.35	4.06	0.139	0.0802
Weighted Average	929	7.42	24.8	32.2	38.9	2.89	4.53	0.140	0.0901
Plot 2. Irrigated every two weeks.									
July 3	35	5.70	24.1	25.2	38.1	2.17	3.53	0.152	0.0935
July 10	159	7.27	25.2	30.4	37.4	2.72	4.55	0.150	0.0895
July 17	243	7.41	24.1	34.4	37.4	2.77	4.64	0.135	0.0805
July 24	107	6.17	23.6	29.3	40.1	2.48	3.69	0.126	0.0746
July 31	110	4.96	20.4	26.7	41.1	2.00	2.96	0.107	0.0749
Weighted Average	652	6.63	23.7	30.6	38.6	2.55	4.05	0.131	0.0830
Plot 3. Irrigated every four weeks.									
July 3	103	6.06	23.9	25.2	39.3	2.39	3.68	0.146	0.0944
July 10	186	7.23	24.1	31.0	39.3	2.84	4.39	0.142	0.0916
July 17	74	6.72	24.0	32.3	37.5	2.52	4.20	0.130	0.0780
July 24	100	5.99	23.6	29.4	38.4	2.30	3.69	0.125	0.0782
July 31	52	4.82	21.0	25.4	41.3	1.99	2.83	0.111	0.0783
Weighted Average	515	6.44	23.6	29.1	39.1	2.51	3.83	0.135	0.0843
Plot 4. Irrigated every eight weeks.									
July 3	101	6.40	23.1	27.2	40.2	2.57	3.82	0.140	0.0945
July 10	126	7.36	25.9	31.0	39.5	2.91	4.45	0.144	0.0939
July 17	89	7.01	23.8	31.9	38.8	2.71	4.30	0.135	0.0850
July 24	64	6.72	23.3	31.5	38.8	2.61	4.11	0.130	0.0829
July 31	22	5.21	25.0	23.9	37.9	1.99	3.25	0.131	0.0740
Weighted Average	398	6.81	25.3	30.0	39.4	2.63	4.13	0.133	0.0841

*Three days before and three days after the date recorded in the table.

Table 6.

The average maximum temperature, minimum humidity, or maximum evaporation during the growth of the cotton for various periods.

Date	Av. maximum temperature after date for			Av. minimum humidity after date for			Average evaporation from black standardized atmometer for		
	7 days	14 days	35 days	7 days	14 days	35 days	7 days cc.	14 days cc.	35 days cc.
				1928					
July 11	87.3	88.4	88.6	59.1	57.2	55.6	35.4	40.7	44.0
July 18	89.4	89.6	88.0	55.3	55.1	52.0	43.9	48.0	41.5
July 25	89.8	89.0	88.1	54.6	55.8	56.9	50.1	45.2	40.2
Aug. 1	86.1	88.2	87.4	56.7	54.9	50.6	40.3	44.3	35.7
Aug. 8	90.0	87.4	86.7	56.1	51.6	52.7	48.3	35.3	32.5
Aug. 15	84.4	87.1	86.5	70.0	65.2	66.4	22.9	31.2	31.1
Aug. 22	89.7	88.0	86.1	60.1	61.6	58.9	39.4	35.6	33.2
Average	88.1	88.1	87.3	58.4	58.8	59.8	40.3	39.8	37.0
				1929					
July 3	87.8	88.4	89.0	51.3	51.9	50.9	49.1	48.2	47.8
July 10	89.1	88.0	89.0	52.6	50.9	51.3	47.3	46.0	45.8
July 17	87.0	88.8	90.0	49.3	50.4	49.3	44.6	46.0	47.7
July 24	90.5	90.6	90.5	51.5	50.7	48.6	41.4	48.5	49.9
July 31	90.6	91.8	91.1	50.0	51.5	47.2	55.6	47.9	53.2
August 7	88.9	91.6	90.7	56.0	48.5	47.5	40.3	48.3	49.2
August 14	91.8	90.8	89.4	44.1	44.2	48.0	56.4	55.2	47.8
Average	90.0	90.0	90.0	50.3	49.7	49.0	47.8	48.3	48.8

Table 7.

The moisture condition of the soil for various periods on the plots irrigated at different frequencies.

Date	Plot 1. Irrigated every week.			Plot 2. Irrigated every two weeks.			Plot 3. Irrigated every four weeks.			Plot 4. Irrigated every eight weeks.		
	Minimum moisture per cent	Av. moisture next 14 days per cent	Av. moisture next 35 days per cent	Minimum moisture per cent	Av. moisture next 14 days per cent	Av. moisture next 35 days per cent	Minimum moisture per cent	Av. moisture next 14 days per cent	Av. moisture next 35 days per cent	Minimum moisture per cent	Av. moisture next 14 days per cent	Av. moisture next 35 days per cent
					1928							
July 18	14.3*	17.9	17.8	15.3*	17.4	16.0	12.9*	15.7	15.1	13.9	11.4	11.8
July 25	15.9*	15.9	17.2	12.2	16.7	14.4	16.0	14.7	13.5	9.2	10.5	11.2
Aug. 1	15.1*	17.0	17.0	19.7*	16.5	15.2	15.3	13.4	12.8	11.1	10.5	11.2
Aug. 8	11.7*	16.0	15.3	15.6	12.8	13.2	11.8	13.5	12.3	11.1	12.2	11.2
Aug. 15	14.3*	15.8	16.2	11.1*	11.8	15.8	12.0*	12.5	13.5	9.4*	11.8	10.7
Aug. 22	12.0*	15.3	16.4	8.6	12.2	12.7	11.7	10.3	11.6	11.2	10.2	10.0
Average	13.6	16.5	16.8	13.4	14.6	14.2	13.5	13.5	13.1	11.0	11.1	11.0
					1929							
July 3	13.1*	15.1	15.3	11.1*	13.5	15.7	9.3*	14.3	12.1	11.3	11.1	10.7
July 10	15.2*	15.6	15.8	14.0	14.1	12.9	14.7	11.9	11.2	11.1	11.2	10.3
July 17	11.9*	15.0	15.1	10.4*	12.0	13.5	13.9	9.1	9.9	10.9	9.2	9.8
July 21	14.7*	15.4	15.2	12.9	12.4	13.4	7.2	9.9	9.0	11.5	10.2	9.4
July 31	11.4*	13.4	14.5	7.8*	11.8	14.0	6.3*	10.8	10.2	5.3*	9.5	9.0
Aug. 7	10.1*	12.4	14.0	11.4	13.4	13.3	11.2	9.1	10.4	8.8	8.6	8.7
Aug. 14	8.7*	13.3	14.0	11.3*	14.0	14.6	9.1	8.2	10.6	9.3	8.5	8.6
Average	12.0	14.7	15.0	11.3	13.0	13.7	10.2	10.3	10.3	9.7	9.7	9.5

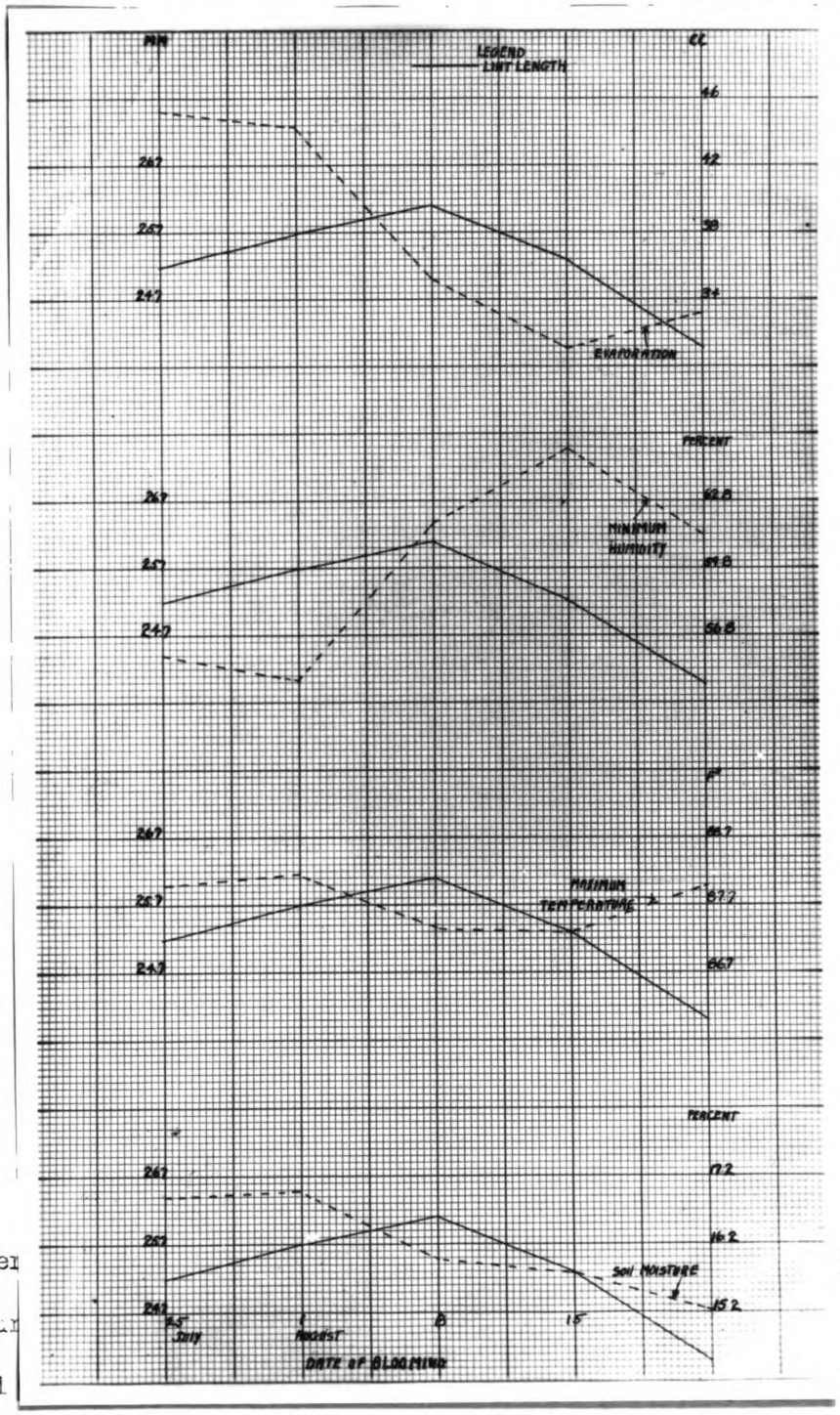
*Date irrigated. Moisture record taken before irrigation was made.

CHART NO. 2

RELATION BETWEEN AVERAGE LENGTH OF LINT AND

EVAPORATION, MINIMUM HUMIDITY, MAXIMUM TEMPERATURE

OR SOIL MOISTURE FOR COTTON IRRIGATED EACH WEEK (PLOT 1) 1928.



(The aver ys, 3 days

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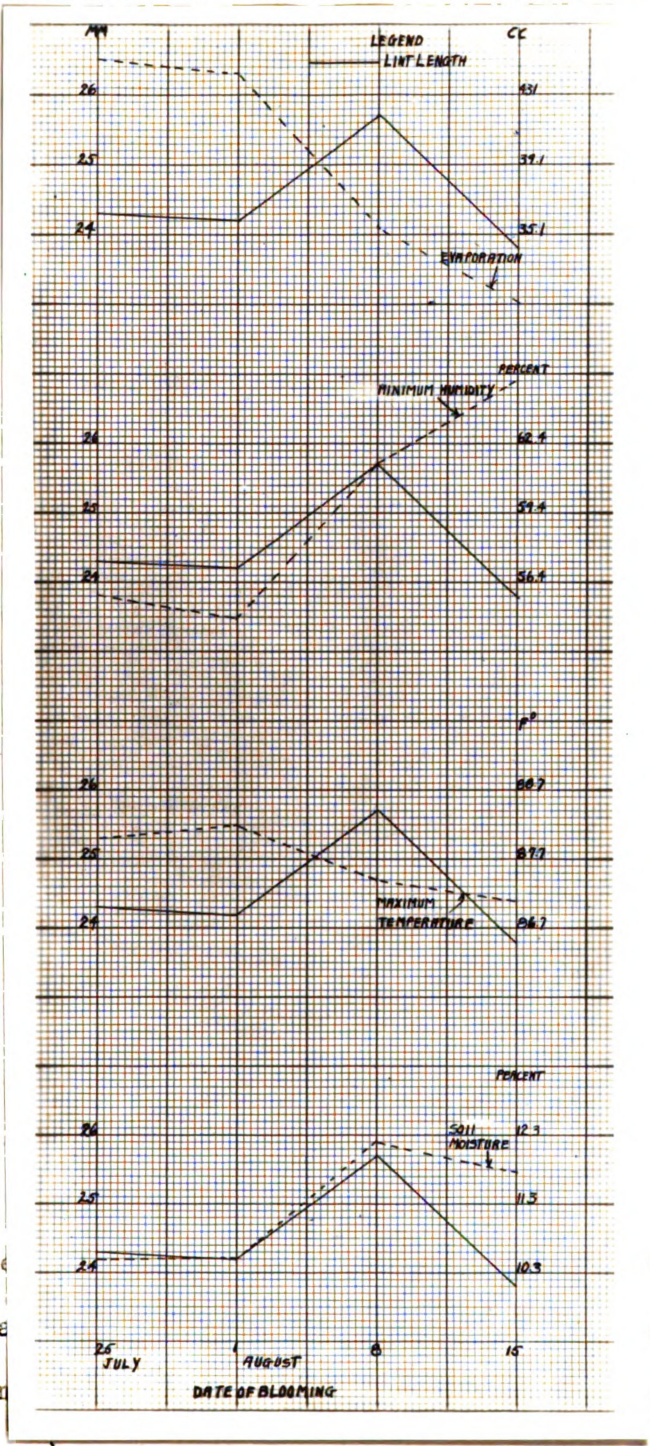
CHART NO. 3

RELATION BETWEEN AVERAGE LENGTH OF LINT AND EVAPORATION, MINIMUM HUMIDITY, MAXIMUM TEMPERATURE OR SOIL MOISTURE FOR COTTON IRRIGATED EVERY 8 WEEKS (PLOT 4) 1928.



(The average le r 7 days, 3 days before and 3 da idity, tempera-ture and soil m 4 days after the date of blooming.)

CHART NO. 4

RELATION BETWEEN AVERAGE LENGTH OF LINT AND EVAPORATION, MINIMUM HUMIDITY, MAXIMUM TEMPERATURE OR SOIL MOISTURE FOR COTTON IRRIGATED EACH WEEK (PLOT 1) 1929.

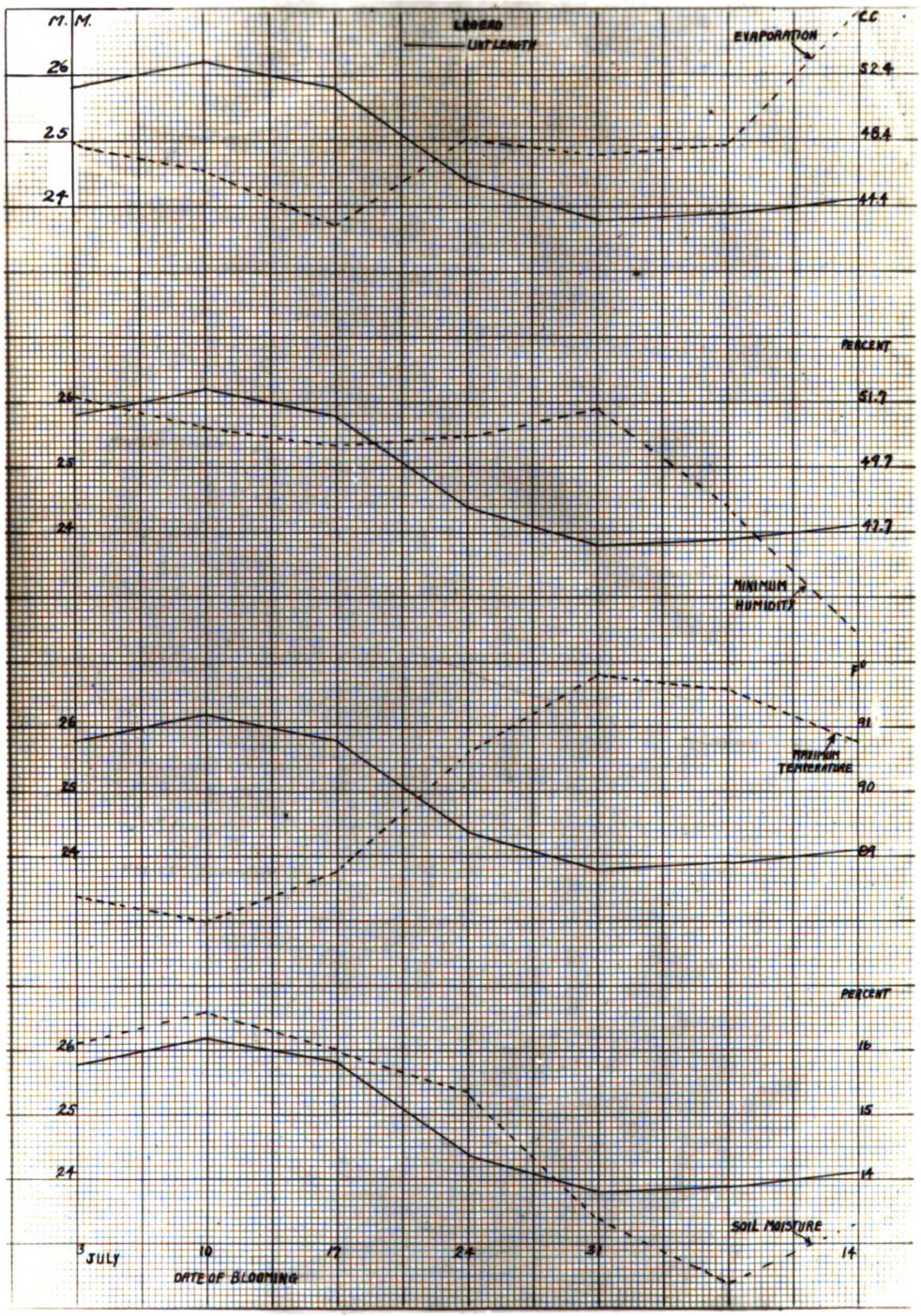


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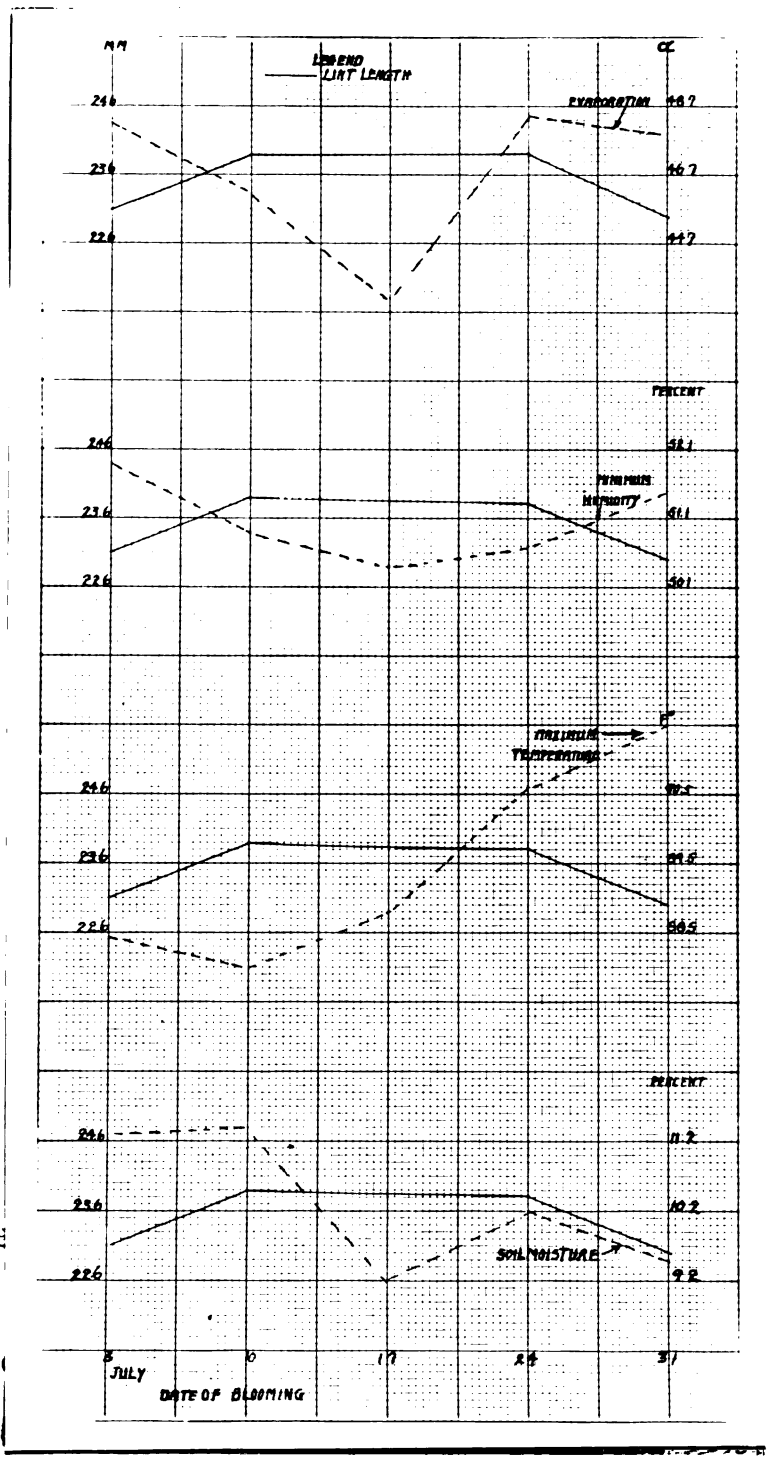
CHART NO. 5

RELATION BETWEEN AVERAGE LENGTH OF LINT AND EVAPORATION, MINIMUM HUMIDITY, MAXIMUM TEMPERATURE OR SOIL MOISTURE FOR COTTON IRRIGATED EVERY 3 WEEKS (PLOT 4) 1929.



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from bolls which were produced from blooms opening on July 30 was 25.8 mm. for plot 1 and only 23.3 mm. for plot 4. Furthermore it is shown that by irrigating on August 15 the length of lint from plot 4 was increased from 23.3 mm. on July 30 to 25.3 mm. on August 5. On August 5 the length of lint from plot 4 was the same as that from plot 1. These data are illustrated by graphs 2 and 3.

In 1929 the average length of lint produced on plot 1 was 24.8 mm. while that on plot 4 was 23.6 mm. From blooms occurring on July 5 the average length of lint produced on plot 1 was 25.5 mm. while that produced on plot 4 was only 22.7 mm. These data are illustrated by graphs 4 and 5.

The graphs show that the length of lint is closely correlated with the moisture content of the soil the first fourteen days after blooming. The moisture data are not absolutely correct because of the method of sampling, but they are very indicative of the moisture content of the soil. It is interesting to note that in time of a moisture shortage an irrigation was followed by an increase in the length of lint. In 1928 an irrigation on August 15 increased the length of lint over 3 mm. on plot 4. In 1929 an irrigation on July 31 increased the length very little. The reason for this difference in response is due to the season. In 1928 the irrigation was followed by cool weather so that the effect of the moisture lasted over a longer period, while in 1929 the irrigation was followed by very hot weather so that the effect of the moisture lasted only a few days. An examination of the records for plot 1 shows this effect very strikingly. In 1928 an irrigation of 1 inch per week kept the moisture content of the soil at a high level but in 1929 the moisture content dropped rapidly in spite of the irrigation. In hot dry weather an irrigation of 1 inch per

week is not enough to maintain the moisture content of the soil at a level sufficient for maximum length of lint. It may be noted from graph 4 that the length of lint on plot 1 decreased as the moisture content of the soil was lowered in 1929.

An examination of graph 6 reveals the fact that the curve for the length of lint precedes that for the moisture curve by about seven days. To make the two curves more nearly coincide it is necessary to shift the moisture curve back about seven days. This indicates that the most critical time in the formation of the length of lint is about the seventh day. The entire period of formation seems to be from the first to the 16th day after blooming.

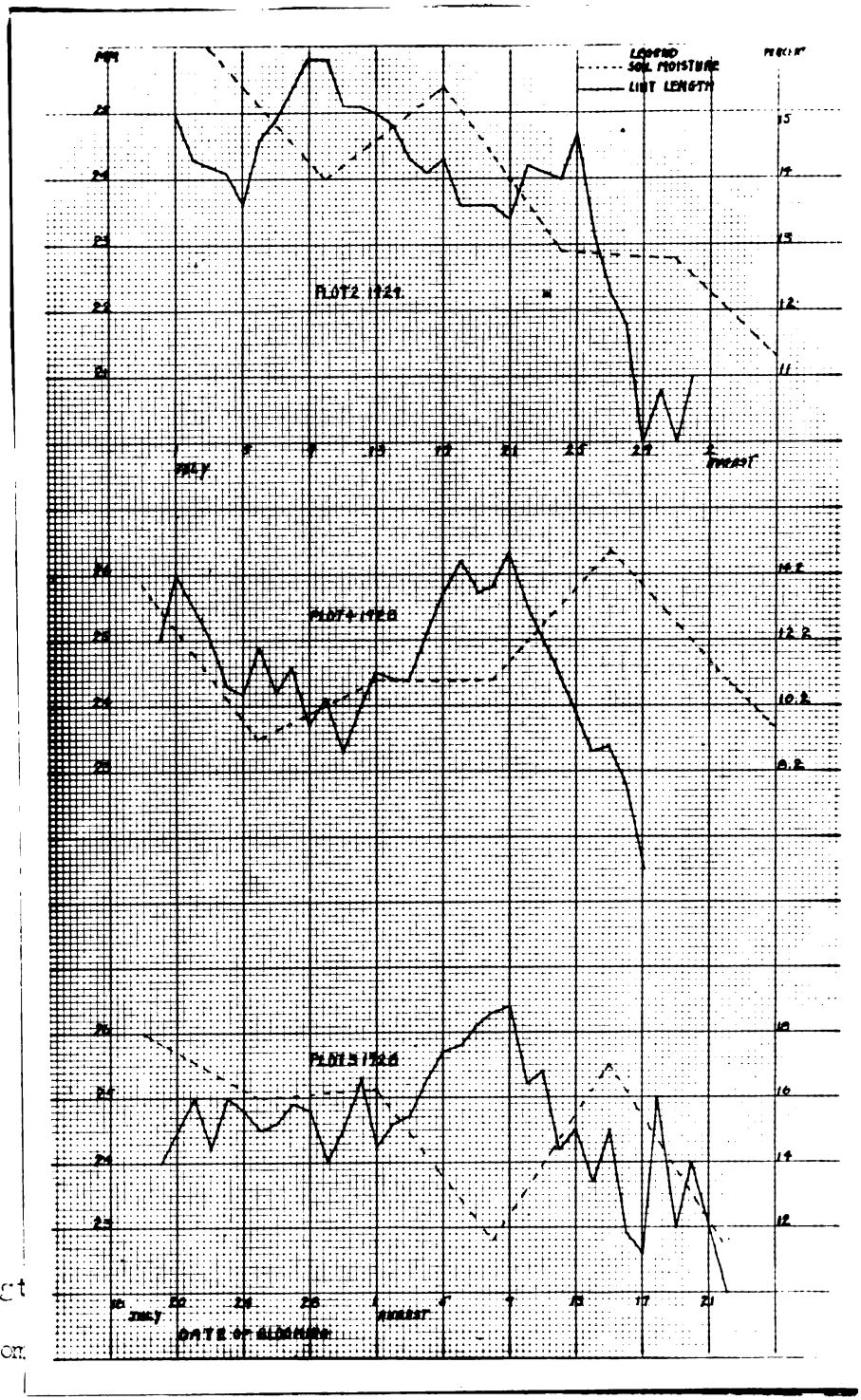
The data in Table 7 for the 14 and 35 day averages was calculated by allowing for the increase in water due to irrigation. For example, the water added by irrigation would increase the moisture content of the first 24 in. of soil by about 5 per cent so that by adding this to the minimum amount present when sampled the true moisture content for that day would be obtained. The method of figuring the average may be illustrated for plot 3 on July 13, 1928 for the next 14 days as follows: July 13 minimum moisture is 12.9 %; on this day 5% was added by irrigation, so the true moisture content was 17.9%. The fourteen day average then is (17.9% plus 13.0% plus 13.3%) divided by 3, or 13.7%.

Studies of Other Characters.

The weight of boll, percentage of lint, number of seed per boll, size of seed, and weight of lint per seed was determined. The data for these may be seen in Tables 2, 3, 4, and 5. Tables 1 to 12 inclusive in the appendix show the data in more detail.

CHART NO. 6

RELATION BETWEEN LENGTH OF LINT AND SOIL MOISTURE.



(The lengt duced from bloom nt moisture in the soil on the date recorded. It will be noted that the length of lint curve precedes the moisture curve by about 7 days.)

Influence of Soil Type, Temperature, Humidity, or Evaporation.

These data do not show any relation between any of the conditions and any of the factors. Some of these results for the size of boll are illustrated by graphs 1, 7, 8, 9, and 10. It may be noted that the weight of the bolls produced by cotton grown on the Norfolk soil was 7.21 gms. in 1928 and 7.34 gms. in 1929, while those produced on the Deer Creek loam weighed 7.46 gms. and 7.57 gms. respectively for the same two years. The percentage of lint for these two soil types was 38.4 per cent and 38.6 per cent respectively in 1928 while in 1929 it was 39.05 per cent on the Norfolk soil and 39.37 per cent on the Deer Creek loam. It is concluded from these results that under the conditions of this experiment the soil type or climatic conditions did not influence the weight of the bolls, the percentage of lint, the weight per seed, or the weight of lint per seed.

Influence of Soil Moisture.

This data may be seen in Tables 4, 5, and 7. In the appendix tables 5 to 12 inclusive the results are shown in more detail. The data shows that the size of the boll was influenced to a marked extent by the soil moisture conditions. In 1928 the bolls on plot 1 averaged 8.1 gms. each in weight while those on plot 4 averaged 6.9 gms. For 1929 the weights are 7.4 and 6.8 gms. respectively. The weights from plots 2 and 3 were intermediate between these two. Graphs 7, 8, 9, and 10 show the relation between soil moisture and the size of the boll, but there is not a distinct critical period like there was in case of the length of lint.

The data show that the percentage of lint was somewhat higher on the drier soil, but there is not a marked relation between the soil moisture and the per cent of lint. The average weight per seed and the average weight of lint per seed was less for the drier soil. The average

CHART NO. 7

RELATION OF WEIGHT OF BOLL TO EVAPORATION,

MINIMUM HUMIDITY, MAXIMUM TEMPERATURE OR SOIL MOISTURE

FOR COTTON IRRIGATED EACH WEEK (PLOT 1) 1928.

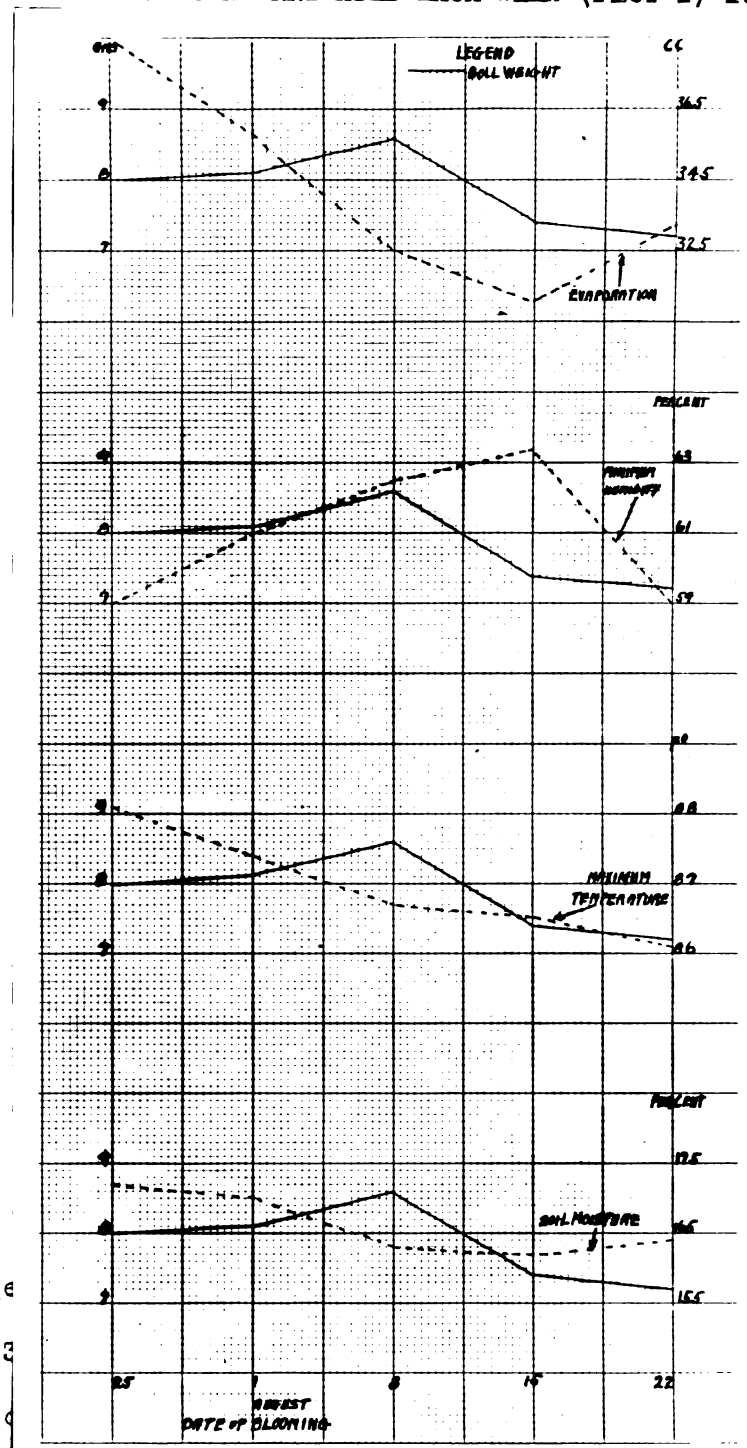


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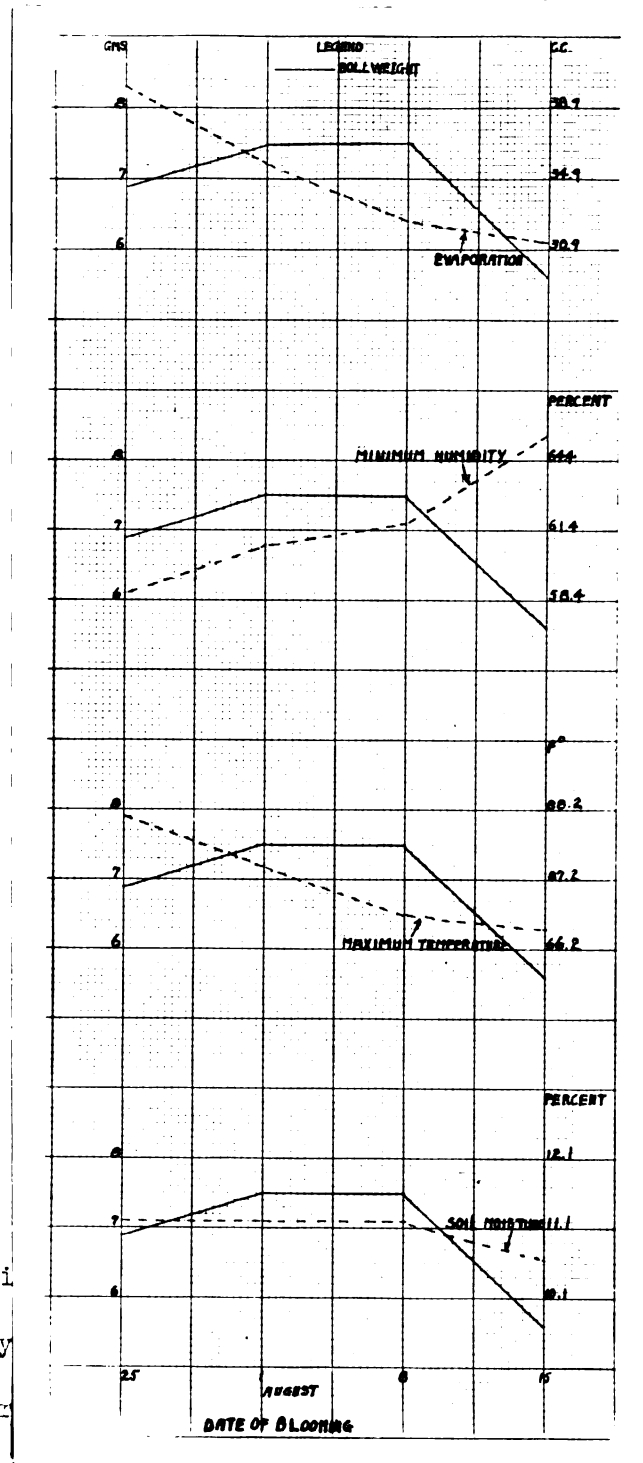
CHART NO. 8

RELATION OF WEIGHT OF BOLL TO EVAPORATION,

MINIMUM HUMIDITY, MAXIMUM TEMPERATURE AND SOIL MOISTURE

FOR COTTON IRRIGATED EVERY 3 WEEKS (PLOT 4) 1923.



(The average wei … or 7 days, 3 days before and 3 da… idity, temperature and soil moistu… after the date of blooming.)

CHART NO. 9

RELATION OF WEIGHT OF BOLL TO EVAPORATION,

MINIMUM HUMIDITY, MAXIMUM TEMPERATURE AND SOIL MOISTURE

FOR COTTON IRRIGATED EACH WEEK (PLOT 1) 1929.

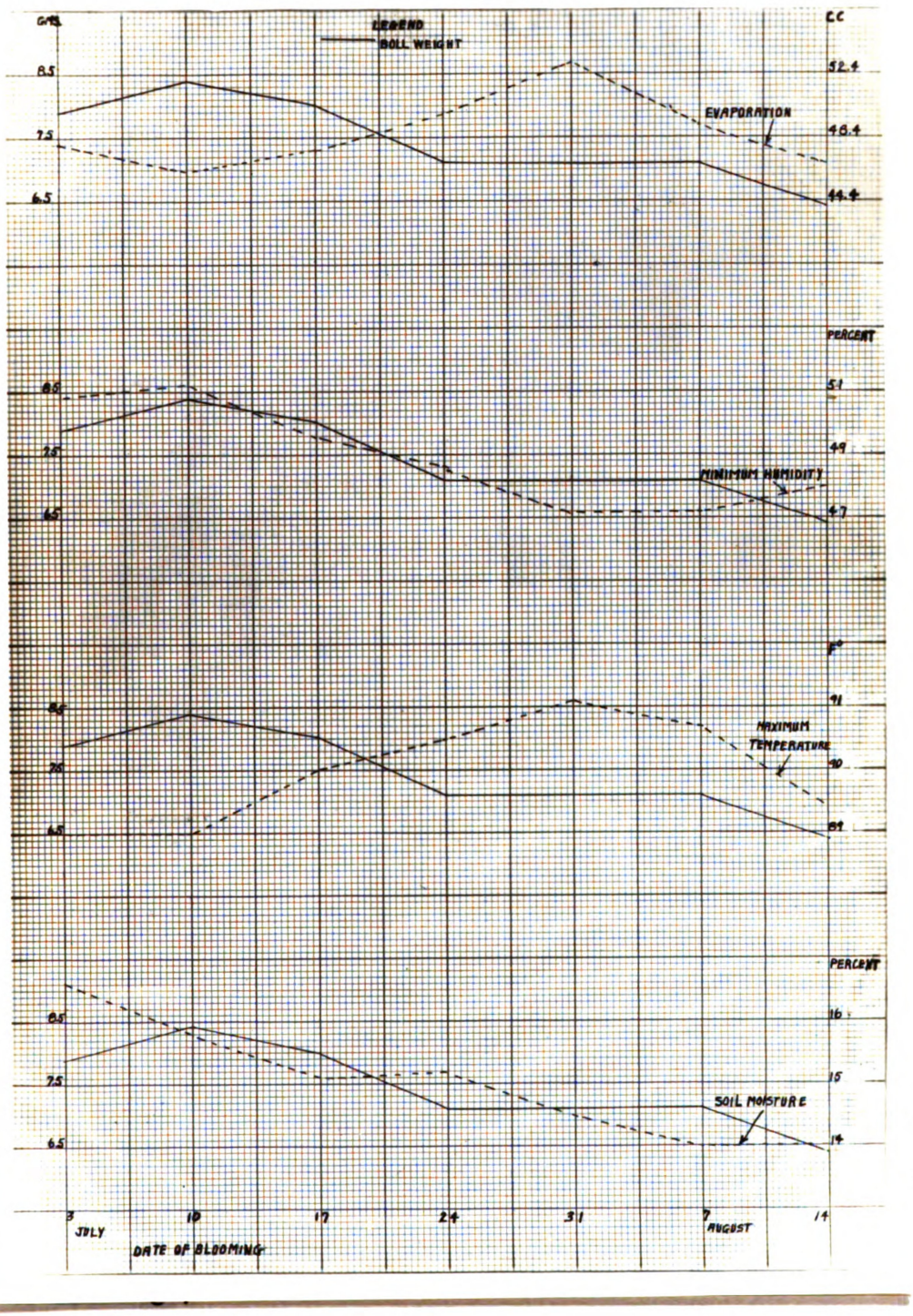


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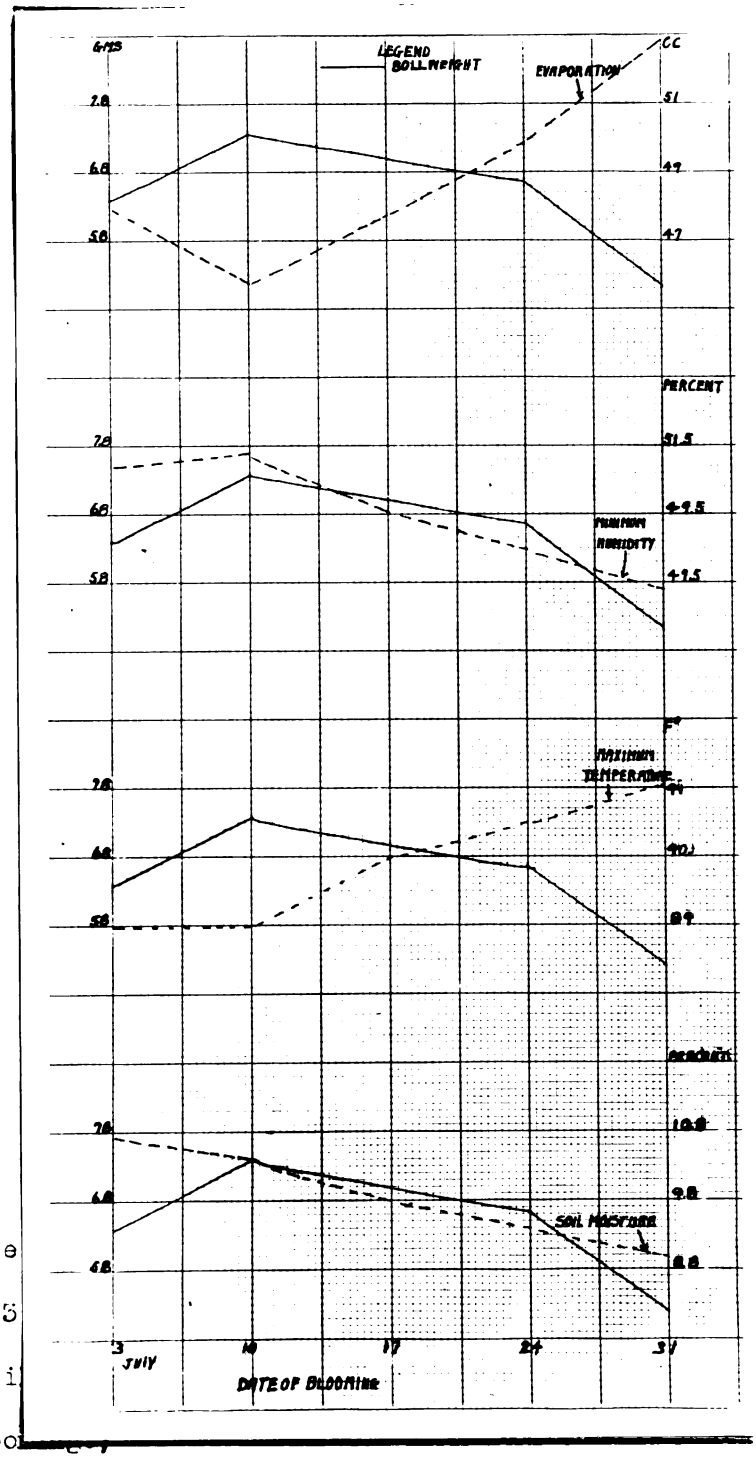
CHART NO. 10

RELATION OF WEIGHT OF BOLL TO EVAPORATION,

MINIMUM HUMIDITY, MAXIMUM TEMPERATURE OR SOIL MOISTURE

FOR COTTON IRRIGATED EVERY 8 WEEKS (PLOT 4) 1929.



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number of seed per boll was the same for both plots. In 1928 the average number of seed per boll was 30.5 for plot 1 and 31.1 for plot 4 while in 1929 it was 32.2 and 30.0 respectively.

DISCUSSION.

The most significant fact obtained from this investigation is that the amount of the soil moisture is the only environmental factor that influenced the development of the seed and lint in cotton. This was true for the length of lint, weight per boll, weight per seed, and weight of lint per seed. The percentage of lint was influenced to some degree by the soil moisture. The temperature, humidity, evaporation, or soil type did not appear to have any effect on any of the determinations made. It is probable that cotton is adapted to growing under any of the temperature conditions encountered in this test without being adversely affected if there is sufficient moisture present. The temperature and evaporation may play an important part in bringing about a moisture deficiency as was shown by the results in 1929 when irrigation at the rate of one inch each week was not sufficient to keep the moisture content of the soil up during a period of dry hot weather. An inch of water added to plot 4 which was very dry was effective in lengthening the lint in 1928 but not in 1929 because in 1928 the irrigation was followed by cool weather while in 1929 it was followed by hot dry weather in which the moisture was used up before the lint had gone through its period of length growth.

The length of lint was always reduced by a shortage in soil moisture if it occurred during the period the lint was growing in length. This reduction was not however in absolute proportion to the reduction in water nor was the increase in length from addition of water in proportion to the amount added. There appears to be a certain minimum and maximum

length of lint for a variety. By reducing the moisture the length would be decreased until this minimum was reached. Further reduction did not decrease the length, which indicates that a stress great enough to reduce it below this minimum must be so great as to cause the boll to be shedded. Additions of water would increase the length of lint up to the maximum but further increase in the moisture would not have any effect. The difference between the minimum and maximum is approximately 3 mm. or 1/8 of an inch for the strain of cotton used in this experiment. Greater differences than this occurred, but they are not averages of many bolls. It may be noted for example that on August 19, 1923 the bolls on plot 1 averaged 27 mm. in length while those on plot 4 averaged 21.5 mm. This is a difference of 5.5 mm., but it is for a few bolls and does not represent reliable averages.

A deficiency in soil moisture any time during the period of the first 16 days after a blossom appears will shorten the length of lint produced by that boll. This reduction is greatest if it occurs around the 7th day, which indicates that this is the period when the lint is making its most rapid growth. No histological studies were made to determine if this was the case in this experiment. Balls reports in his studies that in Egyptian cotton this period is around the 16th day and the entire growth period is approximately 23 days. This difference may be due to the more rapid growing habit of G. hirsutum used in this study.

It is quite generally known that cotton from different sections varies in length. Youngblood attributes this to soil type, while Funchess shows that the same soil may produce the longest lint in the state oneyear and the shortest lint in the state the next year, and he attributes this to rainfall. The results of this experiment do not agree with those of

Youngblood, but they do agree with the idea that Buncheas advanced. In this experiment the two soils that are said to produce cotton greatly differing in value, when placed in the same environment and kept moist produced cotton that was identical when planted to the same variety. If one section produces a cotton that is quite different from another, there must be either a difference in variety or a difference in soil moisture. The soil type in itself had no effect on the cotton, but of course soil types vary in their ability to retain moisture and in so doing may influence it. One cannot always be certain of a soil producing a longer staple than some other one. Any soil is likely to produce short staple cotton in a dry year.

In most of the cotton belt there is enough moisture to produce a good staple in the average season. It seems that the most logical explanation of the differences recognized by the trade is due to variety rather than soil. For example it is known that 20 years ago the cotton produced in the region of Alexander City, Alabama, was a much sought type that always brought a premium, but today this same region produces cotton that is sold at a discount. The soil type has not changed, but the varieties used now are vastly different from those used then.

Balls concluded that the soil moisture affected the length of lint, a longer lint being produced when the soil had more moisture. Parsons found the same thing, but Burd reports the opposite to be true. Burd's results may be explained by Ball's idea that a rise in the water table would suffocate part of the root system and decrease the length of lint formed. The results of this experiment agree with those of Balls and Parsons.

A farmer is very much interested in the minimum staple that a

variety will produce under adverse conditions, because cotton below 7/8 inch in length is not tenderable on future contracts. Consequently the trade does not want such cotton and the farmer may be forced to sell it for a much lower price. To prevent this he should plant a variety that has at least an inch staple so that when a dry year comes the staple will not be less than 7/8 inch. A plant breeder should select for a staple that is at least one inch in length in good years for the same reason.

The weight of the bolls was reduced by a deficiency in soil moisture. This reduction in weight was due to a reduction in both the weight of the seed and the weight of the lint, but the weight of the seed was reduced more than was the weight of the lint per seed. Thus the ginning percent was increased somewhat by the adverse moisture conditions. This is exactly what would be expected since a reduction in the size of the seed reduces the surface and as the seed becomes smaller you have a larger surface from which to grow lint in proportion to the mass of the seed.

The decrease in the weight of the boll was due to a decrease in the weight of seed and lint and not to the number of seed. The number of seed per boll seems to be independent of external conditions. The weight per boll is the result of the numbers of seed, weight per seed, and weight of lint. The lint grows and fills over a long period so that its weight is determined over a long period. The same thing must be true for the seed as there does not seem to be any sharp break in the curve for its weight when the moisture was deficient over a short period. Since there was no immediate reduction in weight of lint nor weight of seed by drought over a short period it would naturally follow that there would not be a sharp break in the curve for the weight of the boll. This is

what happened in this experiment. Changes in the moisture content for a few days were not followed by changes in the size of the boll. It seems that any condition which reduces the weight per boll must act over a long period.

SUMMARY

Studies were made to determine the influence of soil type, climatic conditions, and soil moisture on the development of lint and seed in cotton. Plants were grown in two very different types of soils in large galvanized iron cans to study the influence of soil type. For studying climatic and soil moisture responses plants were grown in the field and irrigated at different intervals. Determinations were made on each boll for weight, length of lint, number of seed, weight of seed, weight of lint per seed, and per cent of lint. The results of this study may be briefly summarized as follows:

1. The amount of moisture in the soil was the most important factor influencing the development of seed and lint in cotton.

2. Soil type did not affect any of the characters studied. Cotton grown in soil from the Mississippi Delta produced lint and seed which were in all respects like that grown in Norfolk sandy loam soil from Alabama.

3. Temperature, humidity, and evaporation had no visible influence on the constituents of seed cotton. Apparently cotton can tolerate the extremes of any of these encountered during this test without being adversely affected.

4. The amount of moisture present in the soil had a very marked effect on the length of lint and weight of boll produced. A low moisture

content caused a short lint and light bolls to be formed.

5. The critical period in the formation of the length of the lint was found to be from 1 to 10 days after blossoming. The most important time during this period is about the seventh day.

6. The critical period for the weight of the boll was from 1 -- 35 days after blossoming.

7. The number of seed per boll appeared to be somewhat independent of environmental influences so that a reduction in boll weight was largely due to a reduction in the weight of seed and weight of lint per seed.

8. The percentage of lint appeared to be increased by a deficiency in soil moisture. This was due to a greater reduction in the weight per seed than in the weight of lint per seed.

9. It was possible to reduce the length of lint at least 8 m.m. (1/3 inch) by reducing the soil moisture to a critical point. A further reduction of the soil moisture was not followed by a reduction in the length of lint. so there appears to be a certain minimum length of lint for this strain of cotton. There is also a maximum length because increasing the soil moisture beyond a certain percentage did not increase the length of lint. It follows that the relation between soil moisture and length of lint is a linear one but the origin of the line is not zero.

10. Any desirable variety of cotton should produce a lint that is at least 1 inch in length under optimum conditions. This is necessary in order that a staple below 7/8 inch in length will not be produced during a dry year.

ACKNOWLEDGMENTS.

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BIBLIOGRAPHY.

1. Balls, W. L. The development and properties of raw cotton. A and C Black Ltd., London. 1915.

2. Burd, L. H. Cotton in St. Vincent. Tropical Agriculture (Trinidad) 2:4. 1927.

3. Burd, L. H. Reports on the research work carried out at the Cotton Experiment Station, St. Vincent, West Indies. Empire Cotton Growing Review, 2:3. 225-233. 1925.

4. Hutchess, L. J. What makes cotton long? Progressive Farmer and Southern Ruralist 1:5. 31. 1931.

5. Harland, S. C. Report of conference on cotton. Textile Recorder 45: 531. 87. 1927.

6. Kearney, T. H. and Harrison, C. J. Length of cotton fiber from bolls at different heights on the plant. Jour. Agr. Research 29:6. 1924.

7. Ludwig, C. A. Some effects of late defoliation in cotton. South Carolina Exp. Sta. Bul. 253.

8. Veihmeyer, F. J. and Hendrickson, A. H. Soil moisture at permanent wilting of plants. Plant Physiol. 3:355-357. 1928.

9. _____. Some factors affecting the irrigation requirements of deciduous orchards. Hilgardia 2:6. 125-257. 1927.

10. Youngblood, B. Relation of soil fertility to the quality of cotton. Mimeographed address at the Meeting of Southern Agricultural workers Houston, Texas. Feb. 6. 1929.

APPENDIX

Table 1.

The average results of various determinations on cotton grown in Norfolk sandy loam soil in 1925.

Blooming Date	Wt. per boll	Length of lint	Total No. bolls	No. of seed per boll	Per cent lint	Wt. of lint per boll	Wt. of seed per boll	Wt. per seed	Wt. of lint per seed
July 13	5.91	27	1	25.0	37.5	2.22	3.69	.147	.0888
July 14	7.435	24	1	28.0	40.3	3.00	4.435	.158	.1071
" 15	7.135	25	1	29.0	37.2	2.65	4.475	.154	.0917
" 16	7.750	25	2	33.0	38.9	3.02	4.75	.143	.0915
" 17	7.255	25.2	5	32.0	36.4	2.66	4.595	.143	.0831
" 18	6.442	25	2	28.5	38.7	2.51	3.932	.137	.0880
" 19	7.768	24	5	33.6	38.5	2.99	4.773	.142	.0989
" 20	7.744	25.1	7	31.7	39.3	3.05	4.697	.148	.0962
" 21	7.553	25.2	4	34.5	39.0	2.94	4.613	.135	.0852
" 22	7.075	25.1	6	31.3	38.9	2.75	4.325	.138	.0878
" 23	7.508	24.7	4	33.5	38.7	2.93	4.545	.133	.0888
" 24	6.943	25.1	9	31.1	38.0	2.64	4.303	.138	.0848
" 25	7.213	24.0	4	31.3	38.0	2.79	4.423	.141	.0891
" 26	7.708	25.0	11	33.2	38.9	3.03	4.678	.140	.0912
" 27	7.283	24.7	11	34.4	40.4	3.92	3.538	.097	.1139
" 28	6.752	25.1	9	32.7	37.8	2.57	4.182	.127	.0785
" 29	7.923	24.5	13	34.8	38.2	3.05	4.899	.140	.0870
" 30	7.933	25.6	8	33.6	37.7	3.01	4.973	.135	.0832
" 31	7.154	25.7	9	33.0	39.5	2.81	4.348	.131	.0851
Aug. 1	7.123	25.4	10	35.7	39.2	2.80	4.323	.121	.0774
" 2	6.801	25.4	7	34.0	38.5	2.63	4.171	.122	.0773
" 3	7.811	25.1	10	36.2	38.8	2.95	4.681	.128	.0814
" 4	6.922	25.4	7	32.6	39.8	2.74	4.182	.127	.0835
" 5	6.71	24.2	7	32.4	38.2	2.62	4.09	.123	.0808
" 6	7.299	24.9	11	31.9	38.5	2.65	4.649	.149	.0830
" 7	6.96	25.1	8	32.5	39.0	2.72	4.24	.130	.0836
" 8	8.385	25.2	9	40.3	39.0	3.25	5.135	.127	.0803
" 9	5.924	24.8	8	31.6	36.6	2.17	3.754	.118	.0686
" 10	8.148	24.9	11	36.0	36.8	3.00	5.148	.142	.0833
" 11	6.652	24.6	4	32.2	37.5	2.50	4.152	.129	.0776
" 12	6 396	24.0	4	35.7	37.3	2.47	4.226	.118	.0691
" 13	4.535	24.0	1	30.0	40.1	1.83	2.725	.090	.0610
" 14	3.18	24.0	1	22.0	43.3	1.38	1.80	.081	.0627
" 15	5.035	26	2	21.0	35.5	1.79	3.245	.154	.0852
" 16	5.52	24	1	28.0	39.1	2.16	3.36	.120	.0771
" 17	4.64	23	1	23.0	37.9	1.76	2.88	.125	.0765
" 18	7.095	25	1	33.0	39.0	2.77	4.325	.083	.0839
Weighted Average	7.211	24.9	219	33.4	38.4	2.73	4.315	.129	.0817

Table 2.

The average results of various determinations on cotton grown in Norfolk sandy loam soil in 1929.

Blooming Date	Wt. per boll	Length of lint	Total No. bolls	No. of seed per boll	Per cent lint	Wt. of lint per boll	Wt. of seed per boll	Wt. per seed	Wt. of lint per seed
July 10	8.615	25	1	34.0	38.7	3.335	5.280	.155	.0980
" 11	7.490	23.3	3	33.3	37.0	2.780	4.710	.141	.0834
" 12	6.570	24.5	4	30.0	39.8	2.540	3.830	.127	.0845
" 13	8.135	25.4	7	36.7	39.2	3.210	4.975	.135	.0874
" 14	8.075	25.7	10	35.6	39.5	3.170	4.905	.137	.0890
" 15	7.743	25.0	12	35.9	39.2	3.030	4.713	.131	.0844
" 16	7.007	24.6	14	34.5	40.0	2.720	4.287	.124	.0788
" 17	7.309	24.4	15	37.6	39.4	2.880	4.429	.117	.0765
" 18	7.393	23.7	13	37.4	40.8	3.020	4.375	.113	.0807
" 19	7.247	24.5	18	37.4	40.3	2.920	4.327	.115	.0780
" 20	6.277	24.0	14	27.5	40.6	2.720	3.557	.129	.0989
" 21	7.145	24.1	8	33.2	40.2	2.89	4.255	.128	.0897
" 22	7.875	24.4	13	37.6	40.4	3.18	4.695	.124	.0845
" 23	7.721	24.0	12	36.2	41.1	3.17	4.551	.125	.0875
" 24	7.375	24.3	3	38.6	37.0	2.88	4.495	.116	.0746
" 25	7.03	24.0	1	38.1	38.1	2.69	4.370	.114	.0706
" 26	7.647	22.5	2	40.5	41.0	3.14	4.507	.111	.0775
" 27	8.148	24	5	36.6	38.0	3.11	5.038	.137	.0849
" 28	0	0	0	0	0	0	0	0	0
" 29	5.830	23	2	33.5	40.3	2.34	3.490	.104	.0698
" 30	8.408	24.3	3	37.0	39.4	3.33	5.078	.137	.0900
" 31	5.050	24.0	2	30.0	40.9	2.01	3.040	.101	.0670
Aug. 1	6.495	22	1	33.0	39.7	2.58	3.905	.118	.0781
" 2	0	0	0	0	0	0	0	0	0
" 3	0	0	0	0	0	0	0	0	0
" 4	0	0	0	0	0	0	0	0	0
" 5	0	0	0	0	0	0	0	0	0
" 6	6.94	23.0	1	28.0	36.5	2.54	4.400	.157	.0907
" 7	6.849	23.7	4	32.0	36.6	2.48	4.369	.133	.0775
" 8	5.955	24.0	1	26.0	40.4	2.41	3.545	.136	.0926
" 11	6.950	24.0	1	40	39.1	2.41	5.540	.139	.0952
Weighted Average	7.342	24.42	33	35.21	39 85	2.932	4.410	.1249	.0833

Table 3.

The average results of various determinations on cotton grown in Deer Creek loam soil in 1928.

Blooming Date	Wt. per boll	Length of lint	Total No. bolls	No. of seed per boll	Per cent lint	Wt. of lint per boll	Wt. of seed per boll	Wt. per seed	Wt. of lint per seed
July 7	5.143	25.5	4	27.5	35.9	2.13	2.983	.108	.0775
" 8	8.345	25.0	1	33.0	40.8	3.37	4.975	.152	.0936
" 9	5.515	25.0	1	22.0	43.9	2.25	2.965	.130	.1022
" 10	5.513	23.6	3	26.0	36.7	2.03	3.486	.134	.0780
" 11	7.173	25.3	3	32.6	37.9	2.74	4.433	.136	.0840
" 12	8.935	24.8	6	32.5	37.6	2.32	4.315	.132	.0806
" 13	4.987	26.5	2	19.0	32.3	1.53	3.427	.180	.0805
" 14	7.372	24.4	5	36.0	39.9	2.95	4.432	.123	.0842
" 15	8.930	24.6	11	31.3	39.7	2.71	4.15	.132	.0855
" 16	7.161	25.1	7	32.5	38.7	2.37	4.291	.132	.0933
" 17	7.377	26.0	16	34.9	38.7	2.89	4.487	.128	.0823
" 18	7.775	25.5	12	33.5	39.0	3.08	4.725	.129	.0935
" 19	8.318	24.4	20	37.2	39.2	3.23	5.036	.132	.0855
" 20	8.001	25.2	21	37.4	40.3	3.22	4.791	.127	.0850
" 21	7.941	25.3	13	33.0	39.1	3.07	4.871	.135	.0852
" 22	7.792	25.3	21	35.1	38.3	2.99	4.802	.133	.0851
" 23	7.873	25.3	15	36.2	39.1	3.11	4.768	.131	.0859
" 24	7.673	24.7	23	34.7	38.2	2.93	4.743	.133	.0844
" 25	7.838	25.1	11	34.0	38.1	2.92	4.948	.145	.0855
" 26	7.943	25.0	24	34.7	39.6	3.09	4.852	.140	.0890
" 27	7.249	25.1	22	33.4	39.2	2.81	4.439	.132	.0841
" 28	7.596	25.1	17	34.5	38.9	2.92	4.676	.135	.0846
" 29	7.871	25.4	17	36.1	37.5	2.92	4.951	.137	.0808
" 30	7.415	25.6	8	39.6	39.0	2.86	4.555	.115	.0722
" 31	7.857	25.5	7	35.8	38.7	3.05	4.808	.134	.0851
Aug. 1	7.596	25.3	11	34.0	38.3	2.70	4.896	.144	.0794
" 2	6.479	24.4	5	32.2	39.1	2.51	3.969	.121	.0785
" 3	7.653	24.8	6	37.0	37.9	2.90	4.753	.123	.0793
" 4	7.502	25.0	8	33.1	39.9	2.98	4.522	.139	.0870
" 5	6.89	24.1	7	35.4	40.3	2.78	4.110	.116	.0785
" 6	5.812	23.7	4	31.2	40.1	2.31	3.502	.112	.0740
" 7	4.44	24.2	5	23.2	43.1	1.93	2.520	.108	.0777
" 8	7.0677	24.4	9	35.4	41.0	2.57	4.497	.127	.0725
" 9	6.056	26.0	4	34.0	37.0	2.43	3.626	.106	.0714
" 10	8.46	24.0	1	31.0	38.0	3.22	5.24	.139	.1038
" 11	2.00	23.0	1	14.0	36.5	0.73	1.27	.090	.0521
" 12	0.76	23.0	1	6.0	55.2	0.42	0.34	.056	.0317
Weighted Average	7.430	25.0	359	34.3	38.4	2.87	4.31	.131	.0778

Table 4.

The average results of various determinations on cotton grown in Deer Creek loam soil in 1928.

Blooming Date	Wt. per boll	Length of lint	Total No. bolls	No. of seed per boll	Per cent lint	Wt. of lint per boll	Wt. of seed per boll	Wt. per seed	Wt. of lint per seed
July 11	9.80	25	1	43.0	42.2	4.14	5.660	.131	.0962
" 12	7.278	24	3	36.3	37.4	2.75	4.528	.124	.0757
" 13	6.958	24.6	3	34.3	39.5	2.76	4.198	.122	.0804
" 14	8.393	24.8	5	39.0	39.3	3.31	5.083	.130	.0848
" 15	7.922	23.3	12	36.8	38.8	3.07	4.852	.131	.0834
" 16	8.001	24.1	10	33.0	40.0	3.08	4.921	.129	.0810
" 17	7.580	23.7	12	37.2	41.7	3.16	4.420	.118	.0849
" 18	8.271	23.4	14	40.2	41.2	3.42	4.851	.120	.0850
" 19	7.914	23.9	15	39.7	39.5	3.13	4.784	.120	.0788
" 20	8.681	24.3	6	37.6	41.0	3.57	5.111	.135	.0949
" 21	7.154	24.5	7	34.2	41.2	2.95	4.204	.122	.0862
" 22	7.731	23.8	5	37.0	40.7	3.19	4.571	.123	.0862
" 23	6.955	23.5	7	35.0	41.2	3.04	3.915	.111	.0868
" 24	8.190	24.0	5	37.6	41.9	3.43	4.760	.126	.0912
" 25	6.511	24.5	4	31.0	35.4	2.54	4.171	.134	.0754
" 26	7.583	24.3	6	35.1	39.4	2.95	4.633	.131	.0840
" 27	6.938	25.6	5	34.0	37.9	2.63	4.218	.124	.0779
" 28	7.239	25.1	7	31.0	38.6	2.80	4.459	.143	.0905
" 29	8.187	24.2	11	36.9	39.0	3.19	4.997	.135	.0864
" 30	7.270	24.0	4	32.5	39.4	2.84	4.430	.136	.0873
" 31	5.755	24.0	2	25.0	42.1	2.44	3.813	.132	.0976
Aug. 1	7.026	25.5	7	33.5	37.6	2.64	4.386	.130	.0788
" 2	7.451	24.3	6	33.5	39.8	2.97	4.481	.133	.0886
" 3	7.045	25.0	8	32.7	37.8	2.67	4.375	.133	.0816
" 4	8.102	24.2	4	36.5	42.6	3.45	4.658	.127	.0945
" 5	7.667	24.1	9	35.0	40.0	3.08	4.607	.131	.0880
" 6	7.497	24.0	2	36.5	41.5	3.12	4.387	.119	.0854
" 7	7.309	24.7	8	35.0	38.7	2.91	4.599	.131	.0831
" 8	7.881	25.5	4	40.5	39.6	3110	4.731	.116	.0765
" 9	7.022	23.2	4	35.2	39.7	2.79	4.232	.120	.0792
" 10	6.552	23.0	5	35.5	38.4	2.66	3.902	.109	.0746
" 11	7.025	23.0	1	35.0	41.7	2.93	4.090	.113	.0838
" 12	7.480	22.5	2	37.5	40.2	3.00	4.480	.119	.0800
" 13	6.470	23.5	4	36.2	38.5	2.49	3.980	.109	.0687
" 14	6.032	25.0	2	29.5	37.2	2.26	3.772	.127	.0766
" 16	7.005	24.0	1	34.5	34.5	2.42	4.585	.152	.0701
Weighted Average	7.573	24.10	211	36.04	39.37	3.017	4.560	.1261	.08389

Table 5.

The average results of various determinations on cotton irrigated each week. (Plot 1). 1928.

Blooming Date	Wt. per boll	Length of lint	Total No. bolls	No. of seed per boll	Per cent lint	Wt. of lint per boll	Wt. of seed per boll	Wt. per seed	Wt. of lint per seed
July 21	10.045	25	1	34	35.9	3.61	6.435	.189	.1031
" 22	9.033	26	3	30.3	37.7	3.28	5.836	.177	.1082
" 23	8.909	25	5	27.0	37.4	2.80	4.869	.181	.0932
" 24	8.933	25.5	4	29.7	35.8	3.10	5.838	.197	.1043
" 25	8.000	25.0	7	29.0	35.1	2.84	5.24	.180	.0979
" 26	7.738	25.9	11	28.0	34.6	2.70	5.038	.179	.0964
" 27	7.93	25.6	14	30.1	35.2	2.83	5.50	.173	.0973
" 28	7.925	25.0	11	29.9	36.5	2.95	4.975	.163	.0953
" 29	8.29	24.9	13	31.0	35.9	3.03	5.25	.168	.0937
" 30	7.96	25.8	11	29.1	34.3	2.74	5.22	.179	.0941
" 31	7.973	25.9	14	30.1	34.5	2.75	5.223	.173	.0913
Aug. 1	7.392	23.6	17	31.7	33.9	2.69	4.502	.142	.0911
" 2	7.263	25.1	8	28.0	37.7	2.70	4.563	.162	.0964
" 3	8.5798	25.5	26	31.0	35.6	3.18	5.399	.174	.1025
" 4	8.388	26.3	20	29.6	35.9	3.00	5.388	.180	.1013
" 5	8.809	23.0	26	31.6	35.8	3.15	5.659	.175	.0998
" 6	8.740	23.0	40	31.2	33.0	3.16	5.58	.178	.1012
" 7	8.212	26.4	45	31.8	35.7	3.06	5.152	.162	.0962
" 8	8.503	23.6	30	30.2	35.1	3.03	5.523	.182	.1013
" 9	8.83	23.8	44	32.6	34.2	2.99	5.67	.175	.0917
" 10	8.77	25.2	43	30.5	35.3	2.99	5.89	.192	.0947
" 11	8.163	23.0	24	31.6	35.5	2.98	5.283	.167	.0911
" 12	7.75	24.4	12	28.5	35.2	2.87	5.08	.178	.0933
" 13	7.201	23.0	16	30.0	34.7	2.59	4.611	.153	.0963
" 14	7.412	25.6	16	29.7	37.0	2.74	4.674	.157	.0922
" 15	7.643	23.2	5	29.8	35.1	2.70	4.943	.140	.0906
" 16	7.400	25.1	9	27.0	34.9	2.61	4.65	.179	.0934
" 17	6.640	25.0	10	27.8	34.1	2.32	4.32	.155	.0830
" 18	7.718	25.4	11	33.0	35.9	2.83	5.078	.154	.0796
" 19	7.55	27.0	5	28.3	35.7	2.73	4.82	.170	.0964
" 20	7.786	24.2	9	29.4	35.5	2.83	4.953	.168	.0962
" 21	6.534	24.1	7	30.0	36.3	2.38	4.204	.140	.0793
" 22	7.245	25.3	3	30.3	35.7	2.61	5.085	.169	.0927
" 23	6.077	24.4	5	24.8	36.4	2.23	3.817	.153	.0911
" 24	7.393	25.5	4	29.2	38.0	2.82	4.765	.163	.0965
" 25	5.223	25	2	29.5	35.5	2.70	2.923	.099	.0915
" 26	10.545	25.0	1	37.0	33.3	3.76	6.505	.177	.1016
" 29	6.81	28	1	31	32.4	2.03	4.23	.202	.0973
Weighted Average	8.130	25.7	531	30.5	35.5	2.90	5.24	.171	.0950

Table 6.

The average results of various determinations on cotton irrigated each week. 1939 (Plot 1)

Blooming Date	Wt. per boll	Length of lint	Total No. bolls	No. of seed per boll	Per cent lint	Wt. of lint per boll	Wt. of seed per boll	Wt. per seed	Wt. of lint per seed
July 3	7.415	25	1	31.0	35.1	2.61	4.805	.155	.0841
" 4	9.127	25	4	33.0	38.6	3.53	5.597	.169	.1069
" 5	7.650	25.5	2	28.0	35.4	2.72	4.930	.176	.0971
" 6	7.568	26.4	9	27.5	36.6	2.76	4.808	.167	.1003
" 7	8.658	26.2	15	32.9	37.2	3.22	5.438	.165	.0978
" 8	8.842	26.7	15	36.0	36.8	3.25	5.592	.155	.0902
" 9	8.691	26.8	25	34.0	37.3	3.24	5.441	.160	.0952
" 10	7.907	26.2	10	28.3	36.7	2.91	4.997	.176	.1028
" 11	8.305	26.0	14	32.0	37.5	3.12	5.185	.161	.0975
" 12	8.217	26.3	33	32.1	36.1	2.99	5.227	.162	.0931
" 13	8.215	26.2	20	33.2	36.4	3.00	5.215	.157	.0905
" 14	7.791	26.5	25	33.6	36.3	2.84	4.951	.149	.0845
" 15	8.649	26.4	36	37.4	36.7	3.19	5.459	.145	.0866
" 16	8.030	25.8	32	33.1	36.9	2.98	5.050	.140	.0931
" 17	6.970	25.9	12	29.9	36.4	2.55	4.420	.147	.0852
" 18	6.820	25.6	13	29.9	37.3	2.55	4.270	.142	.0852
" 19	8.274	25.6	12	37.6	38.2	3.16	5.114	.136	.0840
" 20	8.121	24.6	14	34.7	40.0	3.25	4.871	.140	.0936
" 21	6.726	24.8	18	29.7	39.6	2.68	4.046	.136	.0902
" 22	7.696	24.7	52	33.2	40.3	3.10	4.586	.138	.0936
" 23	7.195	24.6	47	32.2	40.4	2.90	4.295	.133	.0900
" 24	6.746	24.5	42	29.8	39.6	2.67	4.076	.136	.0895
" 25	7.319	24.3	44	31.2	39.7	2.91	4.409	.141	.0935
" 26	6.768	24.7	46	30.5	39.7	2.69	4.078	.133	.0881
" 27	6.995	24.1	62	32.5	39.3	2.77	4.225	.130	.0852
" 28	7.137	23.9	31	34.0	39.4	2.82	4.317	.136	.0829
" 29	7.045	23.5	75	32.0	40.5	2.85	4.195	.131	.0890
" 30	7.265	23.6	72	31.9	40.6	2.95	4.315	.135	.0924
" 31	7.309	24.5	49	31.8	40.1	2.99	4.319	.136	.0940
Aug. 1	6.669	24.0	26	29.1	40.0	2.64	4.029	.138	.0907
" 2	6.707	24.5	8	26.8	38.1	2.55	4.157	.155	.0951
" 3	5.749	24.6	5	25.8	40.1	2.29	3.459	.134	.0887
" 4	8.416	24.2	4	36.2	37.2	3.14	5.276	.145	.0867
" 5	6.571	23.7	8	29.5	39.9	2.63	3.941	.136	.0891
" 6	6.583	23.6	6	27.5	40.4	2.61	3.973	.144	.0949
" 7	7.012	24.2	9	30.7	40.5	2.83	4.182	.136	.0921
" 8	7.903	24.3	4	33.5	36.8	2.90	5.003	.150	.0865
" 9	7.475	24.0	2	30.5	37.9	2.94	4.643	.152	.0931
" 10	4.265	23.0	1	19.0	41.9	1.79	2.475	.130	.0942
" 11	8.330	25.0	2	37.0	37.6	3.12	5.140	.138	.0845
" 12	4.736	22.5	4	25.2	39.2	1.87	2.896	.134	.0806
" 13	7.279	24.1	6	34.0	36.3	2.66	4.619	.136	.0772
" 14	7.715	25.0	2	33.5	34.1	2.65	5.115	.154	.0791
" 15	7.057	26	2	31.5	34.0	[illegible]	4.827	.145	.0777
" 16	[illegible]	23	1	21.0	42.0	2.02	2.700	.132	.0961
Weighted Average	7.416	24.73	960	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.0901

Table 7.

The average results of various laboratory tests on cotton irrigated every two weeks. 1931. (Plot 2)

Blooming Date	Wt. per boll	Length of lint	Total no. bolls	No. of seed per boll	Per cent lint	Wt. of lint per boll	Wt. of seed per boll	Wt. per seed	Wt. of lint per seed
July 13	5.39	25	2	33	38.3	2.19	3.50	.134	.0842
" 18	5.025	23	1	25	38.1	2.38	3.725	.143	.0920
" 19	6.62	25	1	30	37.7	2.50	4.12	.137	.0833
" 20	9.052	25.5	2	34.5	36.0	3.20	5.852	.166	.0927
" 21	7.42	24.4	7	28.4	36.2	2.69	4.73	.166	.0947
" 22	7.371	25.1	6	30.1	38.9	2.86	4.731	.157	.0950
" 23	7.140	25.1	3	29.3	35.3	2.54	4.60	.157	.0852
" 24	7.734	25.2	10	28.0	36.3	2.79	4.934	.179	.0992
" 25	7.514	24.2	10	28.1	37.0	2.71	4.804	.170	.0954
" 26	7.256	24.6	21	28.2	37.7	2.77	4.493	.159	.0982
" 27	7.848	24.5	21	27.9	35.2	2.81	4.765	.169	.0966
" 28	7.472	24.5	52	29.7	37.1	2.80	4.672	.157	.0942
" 29	7.025	24.0	21	30.5	38.9	2.85	4.755	.136	.0772
" 30	7.059	24.4	30	30.1	36.1	2.78	4.279	.132	.0925
" 31	7.725	23.9	14	30.4	39.3	2.76	4.965	.133	.0907
Aug. 1	7.145	23.4	25	30.9	38.3	2.80	4.545	.147	.0941
" 2	6.540	24.1	17	30.5	36.6	2.47	4.118	.135	.0809
" 3	7.203	24.5	29	30.7	37.0	2.68	4.573	.148	.0859
" 4	7.351	25.0	13	30.9	35.5	2.58	4.721	.152	.0851
" 5	7.449	24.9	32	31.6	36.4	2.72	4.729	.149	.0910
" 6	7.316	25.3	23	30.4	37.3	2.71	4.606	.151	.0891
" 7	7.127	25.8	37	30.4	37.4	2.79	4.337	.150	.0917
" 8	7.501	25.9	29	31.2	37.9	2.93	4.571	.149	.0923
" 9	7.426	25.9	39	31.0	37.8	2.94	4.686	.157	.0949
" 10	7.751	24.8	46	31.1	38.8	2.91	4.841	.153	.0935
" 11	6.319	24.1	36	27.1	38.0	2.53	4.089	.150	.0933
" 12	6.300	23.3	38	27.4	39.4	2.45	3.85	.140	.0894
" 13	6.351	22.9	36	27.0	39.4	2.42	3.937	.140	.0864
" 14	6.150	22.8	27	27.1	39.1	2.38	3.81	.140	.0867
" 15	5.997	24.0	2	25.0	37.4	2.24	2.757	.110	.1293
" 16	6.366	22.1	9	27.0	34.8	2.46	4.205	.150	.0878
" 17	7.178	23.0	1	34.0	33.3	2.38	4.548	.133	.0775
" 18	6.82	23.0	1	31.0	32.6	2.23	4.59	.148	.0719
" 19	7.255	24.3	2	30.0	33.4	2.53	4.895	.156	.0853
" 20	7.005	23.0	1	30.0	33.5	2.35	4.445	.149	.0783
" 27	7.501	23.3	3	28.3	35.6	2.33	4.871	.172	.0929
" 28	7.91	27.0	1	28.0	31.0	2.43	5.45	.194	.0973
Weighted Average	7.359	24.3	3.25	29.5	37.4	2.67	4.607	.152	.0905

Table 8.

The average results of various determinations on cotton irrigated every two weeks. 1929. (Plot 2)

Blooming Date	Wt. per boll	Length of lint	Total no. bolls	No. of seed per boll	Per cent lint	Wt. of lint per boll	Wt. of seed per boll	Wt. per seed	Wt. of lint per seed
July 1	6.335	25	1	24	41.5	2.73	3.875	.093	.1150
" 2	5.121	24.5	5	23.5	39.9	2.25	3.851	.135	.0959
" 3	5.725	24.2	4	23.0	38.1	2.21	3.575	.152	.1004
" 4	5.533	24.1	7	29.4	39.4	2.53	3.936	.135	.0877
" 5	5.371	25.6	9	22.2	38.8	2.01	3.351	.151	.0905
" 6	5.075	24.6	9	19.7	38.1	1.91	3.135	.150	.0959
" 7	6.703	24.9	25	25.5	38.7	2.50	4.293	.170	.0977
" 8	7.170	25.4	20	30.7	35.4	2.54	4.630	.150	.0827
" 9	7.251	25.9	21	29.3	36.8	2.62	4.611	.155	.0895
" 10	5.975	25.8	14	24.2	37.3	2.68	4.343	.154	.0962
" 11	7.399	25.1	26	31.5	37.3	2.90	4.799	.152	.0920
" 12	7.584	25.1	33	32.0	38.9	2.95	5.594	.112	.0915
" 13	7.367	25.0	14	30.7	37.2	2.74	4.597	.172	.0892
" 14	7.070	24.8	41	34.7	38.2	2.86	4.810	.138	.0824
" 15	7.358	24.6	64	36.7	37.5	2.91	4.928	.154	.0792
" 16	7.781	24.1	46	36.2	37.5	2.96	4.851	.134	.0809
" 17	6.773	24.3	22	32.1	37.9	2.57	4.203	.151	.0800
" 18	6.978	23.6	27	33.1	38.0	2.64	4.338	.131	.0797
" 19	6.451	23.6	28	29.6	38.2	2.34	4.111	.138	.0790
" 20	7.208	23.6	15	33.6	38.2	2.81	4.398	.130	.0836
" 21	6.467	23.4	20	32.1	38.6	2.52	3.947	.122	.0785
" 22	6.625	24.2	18	31.6	38.8	2.57	4.055	.128	.0813
" 23	6.523	24.1	19	30.2	41.3	2.68	3.846	.127	.0887
" 24	6.206	24.0	18	29.0	41.2	2.55	3.656	.126	.0879
" 25	6.104	24.7	9	29.1	39.7	2.42	3.684	.126	.0831
" 26	6.567	23.2	7	31.8	40.5	2.71	3.857	.121	.0852
" 27	4.652	22.3	16	21.4	39.9	1.92	2.732	.127	.0897
" 28	5.405	21.8	24	29.0	41.6	2.25	3.155	.109	.0775
" 29	4.153	19.0	33	24.3	42.1	1.72	2.435	.100	.0707
" 30	5.269	20.8	31	23.0	42.2	2.19	3.079	.109	.0782
" 31	4.279	19.9	14	24.7	42.3	1.72	2.559	.103	.0696
Aug. 1	5.311	21.0	7	28.9	38.9	2.16	3.451	.119	.0750
" 2	5.85	24.0	1	27.0	36.7	2.14	3.690	.135	.0792
Weighted Average	6.355	23.71	852	30.37	38.3	2.549	4.0515	.1314	.01303

Table 9.

The average results of various determinations on cotton irrigated every four weeks. 1925 (Plot 3)

Blooming Date		Wt. per boll	Length of lint	Total no. bolls	No. of seed per boll	Per cent lint	Wt. of lint per boll	Wt. of seed per boll	Wt. per seed	Wt. of lint per seed
July	15	1.425	24	1	5	36.4	.52	.905	.181	.1040
"	19	6.415	24	1	25	40.9	2.63	3.725	.151	.1052
"	21	6.47	25	1	23	37.7	2.44	4.03	.175	.1060
"	22	6.595	24.2	4	26.0	38.2	2.52	4.075	.153	.0969
"	23	7.67	25	1	33.0	37.9	2.91	4.76	.132	.0908
"	24	6.673	24.8	10	27.0	37.1	2.47	4.203	.155	.0914
"	25	7.247	24.5	4	28.7	39.1	3.07	4.177	.145	.1069
"	26	7.263	24.6	10	28.3	38.9	2.70	4.563	.131	.0954
"	27	7.107	24.9	21	27.9	37.9	2.70	4.407	.157	.0967
"	28	7.241	24.8	13	30.9	38.3	2.99	4.351	.153	.0967
"	29	6.719	24.0	15	30.8	37.6	2.73	3.939	.127	.0902
"	30	6.795	24.5	29	27.5	36.9	2.40	4.395	.159	.0859
"	31	7.103	25.3	22	29.9	36.3	2.59	4.523	.151	.0865
Aug.	1	7.281	24.2	15	30.5	38.0	2.77	4.491	.147	.0903
"	2	6.931	24.6	19	30.6	36.8	2.59	4.391	.143	.0848
"	3	7.127	24.7	20	31.3	37.5	2.68	4.447	.142	.0849
"	4	6.563	25.3	22	29.0	36.5	2.40	4.163	.143	.0827
"	5	7.51	25.7	28	31.6	36.6	2.75	4.76	.150	.0870
"	6	7.193	25.8	28	30.8	36.0	2.61	4.586	.143	.0847
"	7	7.211	26.1	34	31.1	36.9	2.63	4.581	.143	.0835
"	8	7.823	25.3	34	32.0	36.6	2.91	4.973	.155	.0909
"	9	7.71	25.4	40	31.7	36.9	2.84	4.87	.153	.0895
"	10	7.384	25.2	40	31.2	38.1	2.73	4.644	.145	.0891
"	11	6.154	25.4	25	27.2	38.1	2.34	3.814	.140	.0860
"	12	5.314	24.2	38	26.2	39.5	2.07	3.244	.123	.0790
"	13	5.345	24.5	29	27.3	39.4	2.10	3.245	.113	.0769
"	14	5.511	23.7	32	27.5	40.4	2.18	3.131	.113	.0792
"	15	6.763	24.5	7	27.8	37.7	2.68	4.083	.143	.0954
"	16	5.636	22.9	11	24.9	43.5	2.20	3.436	.140	.0883
"	17	7.594	22.6	5	31.4	36.9	2.91	4.684	.149	.0926
"	18	6.338	25.0	2	29.5	37.0	2.56	4.328	.143	.0867
"	19	6.645	23.0	1	30.0	37.3	2.48	4.165	.138	.0826
"	20	5.932	24.0	2	25.0	43.4	2.44	3.492	.159	.0976
"	21	8.585								
"	22	4.84	22.0	1	20.0	44.0	3.05	1.79	.089	.1525
"	25	3.085	23.5	2	15.5	35.6	1.08	2.055	.132	.0664
Weighted Average		6.78	24.5	562	29.3	37.3	2.57	4.225	.144	.0877

Table 10.

The average results of various determinations on cotton irrigated every four weeks. 1939. (Plot 3)

Blooming Date	Wt. per boll	Length of lint	Total no. bolls	No. of seed per boll	Per cent lint	Wt. of lint per boll	Wt. of seed per boll	Wt. per seed	Wt. of lint per seed
June 28	7.155	25	1	31.0	33.3	2.32	4.535	.146	.0845
" 29	3.023	23	3	24.0	33.9	2.34	3.683	.153	.0975
" 30	3.29	24	1	24.0	39.4	2.43	3.300	.150	.1035
July 1	5.445	24.1	9	23.7	39.7	2.17	3.275	.133	.0915
" 2	3.672	23.7	17	23.4	40.0	2.33	4.012	.141	.0955
" 3	3.581	24.3	13	23.3	39.3	2.52	3.951	.143	.0939
" 4	3.301	24.0	15	21.0	39.2	2.10	3.201	.132	.1000
" 5	3.124	23.3	14	25.2	40.0	2.47	3.354	.145	.0930
" 6	3.931	23.9	27	25.1	39.1	2.27	3.631	.145	.0904
" 7	3.797	23.3	33	23.7	38.7	2.33	4.137	.145	.0918
" 8	7.477	24.3	42	31.9	38.7	2.90	4.777	.149	.0909
" 9	7.353	24.1	29	33.2	39.4	3.05	4.305	.139	.0918
" 10	7.093	24.3	10	29.5	39.2	2.78	4.313	.143	.0942
" 11	7.105	23.3	13	29.5	39.7	2.81	4.295	.145	.0952
" 12	7.130	23.8	33	30.9	40.0	2.87	4.290	.138	.0928
" 13	7.119	24.7	19	33.4	39.0	2.80	4.319	.133	.0884
" 14	6.330	24.3	24	31.3	38.2	2.30	4.230	.135	.0885
" 15	7.326	24.1	10	33.2	37.1	2.73	4.596	.130	.0775
" 16	6.999	23.3	14	33.3	37.7	2.61	4.229	.133	.0785
" 17	6.622	23.3	2	31.0	35.3	2.33	4.272	.137	.0755
" 18	6.710	24.3	13	33.3	35.4	2.45	4.260	.130	.0751
" 19	5.241	23.3	4	29.0	39.7	2.08	3.151	.109	.0717
" 20	5.947	24.1	7	30.8	37.1	2.22	5.727	.132	.0720
" 21	6.342	23.9	12	31.0	37.2	2.43	4.132	.134	.0800
" 22	6.813	24.1	12	33.3	37.3	2.53	4.333	.131	.0793
" 23	5.396	24.0	23	30.3	37.3	2.13	3.923	.127	.0709
" 24	5.677	23.7	14	31.3	37.2	2.13	3.547	.113	.0680
" 25	6.537	24.0	9	32.4	33.3	2.31	4.057	.129	.0774
" 26	5.957	23.3	5	27.0	37.9	2.22	3.735	.133	.0822
" 27	4.343	22.3	24	24.3	42.0	1.37	2.976	.113	.0810
" 28	5.302	22.2	15	27.3	42.3	2.30	3.102	.111	.0791
" 29	4.374	20.1	13	27.0	41.3	2.10	2.374	.103	.0777
" 30	4.345	20.7	14	25.3	40.9	1.34	2.705	.113	.0729
" 31	3.332	20.3	4	18.3	38.1	1.29	2.232	.123	.0897
Aug. 1	4.413	22.3	2	22.3	42.7	1.34	2.373	.114	.0772
Weighted Average	5.457	23.31	513	29.1	39.09	2.314	39.42	.1048	.0931

Table 11.

The average results of various determinations on cotton irrigated every eight weeks. 1928 (Plot 4)

Blooming Date	Wt. per boll	Length of lint	Total no. bolls	No. of seed per boll	Per cent lint	Wt. of lint per boll	Wt. of seed per boll	Wt. per seed	Wt. of lint per seed
July 19	5.285	25	1	34.0	36.5	1.93	3.355	.098	.0567
" 20	5.02	26	1	30.0	33.0	1.66	3.39	.113	.0553
" 22	6.080	25	3	33.3	38.0	2.31	3.57	.105	.0954
" 23	5.719	24.3	6	26.5	37.9	2.16	3.559	.134	.0815
" 24	5.694	24.2	12	28.2	37.0	2.13	3.564	.126	.0755
" 25	6.939	24.9	13	30.0	37.3	2.60	4.339	.145	.0866
" 26	6.922	24.2	19	29.5	38.2	2.61	4.212	.143	.0890
" 27	7.143	24.6	25	32.2	38.3	2.37	4.273	.130	.0875
" 28	7.905	25.7	18	33.6	39.6	3.05	4.855	.144	.0907
" 29	7.449	24.1	31	32.2	38.5	2.81	4.639	.140	.0908
" 30	7.306	26.5	18	31.5	39.1	2.75	4.436	.141	.0870
" 31	7.407	25.9	21	30.6	37.3	2.62	4.677	.152	.0921
Aug. 1	7.927	24.5	27	33.3	39.4	3.05	4.777	.143	.0915
" 2	7.307	24.4	17	32.3	37.3	2.74	4.567	.139	.0855
" 3	7.613	24.4	15	33.0	37.4	2.85	4.738	.114	.0733
" 4	7.609	25.1	23	32.5	38.9	2.91	4.699	.145	.0900
" 5	7.199	25.3	21	31.3	38.7	2.84	4.539	.145	.0948
" 6	7.494	26.2	22	33.2	37.9	2.87	4.624	.139	.0864
" 7	8.278	25.7	13	32.5	37.2	2.98	5.298	.134	.0822
" 8	8.200	25.9	12	33.0	37.7	3.28	4.97	.130	.0990
" 9	7.940	26.3	18	34.2	36.1	2.87	5.07	.143	.0869
" 10	7.182	25.5	29	31.5	38.8	2.59	4.542	.144	.0822
" 11	6.932	25.0	20	29.6	37.1	2.52	4.312	.145	.0851
" 12	5.741	24.3	29	30.4	38.8	2.26	3.511	.115	.0753
" 13	5.387	23.9	26	28.3	39.9	2.25	3.487	.120	.0789
" 14	4.772	23.3	25	27.5	40.2	1.92	2.852	.103	.0698
" 15	4.875	23.5	2	23.0	40.8	1.99	2.885	.085	.1255
" 16	5.673	23.4	9	27.3	40.3	2.44	3.236	.118	.0893
" 17	6.851	22.8	3	30.1	37.1	2.80	4.061	.135	.0764
" 19	6.590	21.5	2	34.0	42.8	2.71	3.88	.109	.0797
" 20	6.875	24.0	1	27.0	41.1	2.83	4.045	.149	.1048
" 21	6.735	24.0	2	27.0	42.3	2.86	3.875	.143	.1059
Weighted Average	6.947	24.8	488	31.1	38.1	2.65	4.272	.137	.0852

- Table 12.

The average results of various determinations on cotton irrigated every eight weeks. 1929. (Plot 4)

Blooming Date	Wt. per boll	Length of lint	Total no. bolls	No. of seed per boll	Per cent lint	Wt. of lint per boll	Wt. of seed per boll	Wt. per seed	Wt. of lint per seed
June 29	5.637	22	2	25.0	41.0	2.31	3.327	.133	.0924
" 30	4.86	24	1	25.0	39.4	1.91	2.950	.120	.0760
July 1	4.974	23.6	5	22.2	42.0	2.09	2.884	.130	.0936
" 2	6.230	23.1	17	26.6	41.2	2.55	3.700	.139	.0952
" 3	7.10	25.3	12	29.0	40.5	2.88	4.220	.145	.0993
" 4	5.729	25.0	11	22.4	39.5	2.25	3.479	.154	.1008
" 5	6.480	23.7	14	29.2	40.9	2.65	3.830	.130	.0910
" 6	6.382	23.5	39	28.4	39.4	2.64	4.022	.141	.0929
" 7	6.675	24.0	22	27.7	38.8	2.61	4.065	.146	.0942
" 8	7.852	24.0	34	31.8	39.3	3.02	4.852	.153	.0949
" 9	7.920	23.7	15	33.6	39.6	3.12	4.800	.142	.0925
" 10	7.037	25.3	12	29.5	41.4	2.92	4.117	.139	.0959
" 11	7.580	24.6	16	31.6	40.5	3.01	4.580	.134	.0952
" 12	7.835	24.2	17	31.8	39.8	2.82	4.815	.141	.0880
" 13	7.856	24.2	12	31.6	39.7	2.92	4.416	.139	.0924
" 14	6.144	23.4	19	27.3	38.8	2.37	3.774	.138	.0868
" 15	7.467	24.2	19	34.4	37.9	2.83	4.637	.134	.0822
" 16	7.326	23.8	15	34.2	38.5	2.82	4.506	.131	.0824
" 17	7.97	25.0	1	33.0	38.3	3.06	4.910	.148	.0927
" 18	7.305	23.7	7	31.2	40.3	2.94	4.665	.139	.0942
" 19	6.813	23.7	4	32.7	40.0	2.70	4.113	.125	.0825
" 20	7.141	23.7	4	34.2	40.7	2.92	4.231	.123	.0853
" 21	6.502	25.5	7	30.1	38.5	2.49	4.012	.133	.0827
" 22	6.773	23.5	16	29.0	40.3	2.71	4.063	.140	.0934
" 23	7.463	24.2	21	35.0	38.9	2.91	4.559	.130	.0831
" 24	6.346	24.2	9	30.7	38.9	2.45	3.996	.129	.0798
" 25	7.130	24.0	2	33.0	38.5	2.74	4.390	.121	.0701
" 26	4.099	23.0	2	24.5	38.5	1.57	2.727	.111	.0659
" 27	5.392	25.2	7	29.4	37.7	2.11	3.552	.120	.0727
" 28	5.702	24.0	2	29.0	37.2	2.16	3.852	.129	.0771
" 29	5.478	23.5	6	29.5	38.4	2.11	3.505	.114	.0715
" 30	5.756	25.2	4	29.7	37.0	2.12	3.588	.122	.0713
" 31	5.122	25.4	5	24.4	37.9	1.93	3.142	.123	.0811
Aug. 1	4.010	23.3	3	20.3	36.8	1.47	2.540	.124	.0715
" 2	5.100	21.5	2	23.5	38.5	1.93	3.130	.111	.0794
Weighted Average	6.211	23.64	382	30.0	39.4	2.682	4.130	.1357	.0410

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